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King's Peg is Now Too Mild a Drink

**Stimulants No Longer Suffice to Bolster the Failing Nerves of the
Disciples of Schrecklichkeit—America Answers the U-Boat Challenge**

EDWARD N. HURLEY, chairman of the shipping board has come to be known to the American people as a man of action. We have a justified faith, therefore, in his promises, and on those rare occasions, when he speaks of the great work he has undertaken, there is the force of achievement behind his utterance. His words are so weighted with actuality that their reverberations are plainly audible even in the halls of Potsdam. Of special significance were his remarks at the conference of Atlantic coast shipbuilders in Washington on Oct. 31. He said in part:

"We are going to build 6,000,000 deadweight tons of ships in 1918. I say we are going to do it, rather than that we are going to try to do it, because I know that anything America sets out to do she does. As a fighting nation, we have a clean record for victory. We've got the men, we've got the money, and we've got a cause that is right.

No Doubt Where Shipbuilders Stand

"Neither Admiral Capps nor I are going to ask any of you men if you are going to do your full part. We know you are. And, for our part, we are going the limit in working with you. In striving for this new goal we have set for ourselves, we are going to cut out red tape. Whatever help labor needs, we'll give to labor. Whatever help the shipyards need, we'll give to the shipyards."

Here is the answer to the U-boat, the only answer the Junker will ever understand. We wish it could be posted in every German city, village and town alongside that monstrous boast of February, 1917, proclaiming to the world a submarine victory in three months.

Already, one by one, the units of the new fleet are being launched—merchantmen by the thousand with hundreds of sleek destroyers to protect them from the assassins of the deep.

The U-boat game is up. We have scotched the snake and in a year or so we shall be in at the death.

The chances of a ship's being sunk in the war zone are now one in two-hundred. The average weekly losses of Britain ships have been scaled down from

20.4 for March-April-May to 13.4 for September and October. This shrinkage amounts to 35 per cent. Even vessels actually attacked have two chances out of three to get away. The convoying destroyers are ever alert and constantly growing more skillful. The U-boat commander who now ventures out of his comparatively safe haven on the Belgian coast, knows he is running a fifty-fifty chance of ending his earthly career in a sheet of flame in mid-Atlantic. Is there any wonder that submarine captains go mad, that German crews mutiny or that both once safely ashore, seek to drown their haunting fears in stiff drafts of "king's peg", champagne with a brandy chaser.

"King's Peg" Too Mild

Von Tirpitz and his murderous crew will soon find this drink too mild to bolster their shattered nerves, for the effect of our mammoth building program is hardly yet evident. Early next year as our new merchantmen, by tens and scores, set out for France, Italy and the Mediterranean, the final chapter in the story of world's greatest gamble will be written. Germany played her trump card before we were even ready to bid. But our stakes are now on the table and we know who takes the money.

Ships are to be built as never before in the world. A mere glimpse into one or two of our great shipyards is sufficient to give one a concrete idea of our new program. One builder on the lakes is turning out a ship a week. Others are doing as well.

Ships We Shall Have

Deadly as is the drum-fire of Haig's artillery, the steady roar of the riveting hammers in the shipyards that now dot the far-flung borders of America is more killing to German hopes and ambitions. Some day this epic of American constructive genius will be published in all its details. Today it is sufficient to know that American shipbuilders from coast to coast, from lakes to gulf are on the job. "Ships will win the war," said Northcliffe. So be it. Ships we shall have.

Coping With War's Demand for Ships

A Discussion of the War Problems Confronting American Shipbuilders—

Thousands of Men Must Be Trained—Duties of Employer and Employee

By Homer L. Ferguson

IN SPEAKING of what we shipbuilders are doing and contemplating doing, I feel somewhat like a friend of mine on the general staff of the army. He said he had so many secrets he was almost afraid to go to sleep at night for fear he would talk in his sleep and give some of them away. My principal criticism as a civilian, of the war, is that in some aspects it is like looking at a baseball game without knowing what the score is or who is at the bat. The news that an unknown ship on an unknown sea encountered an unknown submarine, and that an unknown person had lost his life may be interesting to a great many people, but it is very dull reading. It is hoped that before we get through some ginger will be put into the situation, so that we will feel as if we are in a fight; and personally I feel that publicity in the United States is the only way in which the people can be aroused. Publicity will come sooner or later in the casualty list, if not in some other way, and then we will know as a people that we are at war. Censorship is very well in so far as it maintains necessary secrecy, but my own judgment is that it is very much overdone. It is of course necessary to watch the cables and the wireless, to see that no improper information is carried abroad.

In a military sense, this war is narrowed down to the question as to whether the German submarines can sink the English ships, and those of the allies at such a rate as to force peace upon Great Britain, ourselves and the other allies before the Germans are sufficiently thrashed on land to recognize that fact. When the submarine campaign was started in February, the German minister of the navy promised his people that in August of this year England would be brought to her knees. The rate of sinking for a time increased until it became probably three or four times the rate of building.

There have been two schools of thought regarding the proper method of meeting the German submarine

campaign. One school has held that only by the production of the maximum number of ships in the shortest space of time until the production of new vessels should more than equal the destruction of vessels in being, would the question be answered. The other school has held that there were vessels in plenty to feed England and to carry our troops to France and to feed them, and that the proper method to meet this menace was to build a large number of submarine chasers, destroyers and other vessels of war to go after the submarine itself. There is a very strong feeling that catching the submarine away from its base is something like catching bees out among the flowers instead of in the hive.

We are told now—at least it is hinted at in the newspapers—that Admiral Mayo and his staff back from Europe, contemplate sending our fleet into a close blockade of the German U-boat. That could be probably done.

World's Largest Ship Owner

The exponent in an official way of the theory of building the maximum number of ships is, of course, the United States shipping board, with the Emergency Fleet corporation as the largest individual owner and builder of merchant ships anywhere, either at this time or at any other time, in the history of the world. All of the shipbuilders have had their new ships commandeered by the shipping board, and these ships are now being pushed to completion under the direction of the shipping board. In addition to the ships under construction at the time the shipping board took over all these vessels on Aug. 3, the shipping board has placed contracts for 200 to 300 additional steel ships and for about 200 wooden and composite ships. The English have built ships at a very rapid rate during the past six months, but prior to that time their capacity had fallen off woefully. The figures of British shipbuilders are that in normal years their capacity in tons was about two million. In 1915 they built only 700,000 tons. In 1916 only 550,000 tons. In the first six months of 1917 they built 500,000 and by the end of 1917 they will have built during this

year almost two million tons, or practically their normal tonnage.

In comparison, it is interesting to look at our record, which is mostly in the future. The largest tonnage ever built by us in any year prior to the present year was in 1908, when we built 615,000 tons. In 1917, or at the end of the fiscal year of 1916-17, on July 1, the total tonnage turned out in merchant ships in this country was close to 800,000 tons. Of course we expect that that will be bettered very much, and the production, except for labor difficulties, would have been very much greater than that; but it is a far cry from 800,000 or 1,000,000 tons of ships a year to a prospective 2,500,000 to 5,000,000 tons of ships a year, and especially when we consider that the best the first shipbuilding country of the world ever did in any one year was only 3,000,000 tons.

Now as to the methods of turning out such an enormous tonnage in a short time. The standardized ship was first thought of by Noah. It certainly would have been had he built a second ark. Every other shipbuilder has thought what a joyful thing it would be if he could only build two or three or four ships just alike. If the war does nothing else for shipbuilding, it will at least demonstrate that the individual tastes of individual owners need not be met in every instance. Ships are not built alike for the reason that ships are built by units and tens instead of by thousands. It is certainly not possible under ordinary circumstances with a very scattered ownership. But with a single ownership, like the Emergency Fleet corporation, it becomes possible for the owner to specify that all ships shall be alike, and thus we have standard ships!

The fabricated ship has the center of the stage at the present time. In England a standardized ship was adopted which is very much like a fabricated ship, and they are being turned out at a rapid rate. The first ships have already been completed and are on the sea now, if indeed they have not already arrived in this country. The fabricated ship, like the English standard ship, has the disadvantage of low speed, and at the same time it has the advantage of a

Extracted from the *Journal of the Engineers' Club, and Affiliated Societies, Philadelphia*. The author is president of the Newport News Ship Building & Drydock Co.

large carrying capacity. The records of submarine sinkings, such as have been gathered, indicate that speed is probably the safest defense against the submarine.

Torpedoes Less Effective

The number of very slow ships sunk is very great in proportion to the number attacked. Probably 90 per cent of the slow ships are sunk when attacked by a submarine. As the speed becomes greater the immunity of the ship from torpedo attack becomes greater—not only because she presents a more difficult target but

to ship them in the slower vessels. We have at the present time in this country enough vessels in commission to ship soldiers to Europe at the rate of not more than 1,000,000 a year. That includes all vessels of 14 knots or over. But, by building a large ship as well as a speedy ship an additional factor of safety is obtained, which may be illustrated by stating that a torpedo will blow just as big a hole in a little ship as a big ship. When a small, short ship has a large hole in it a relatively larger proportion of its length is open to the sea. When a similar hole is blown into a

over by a number of concerns in a position to undertake this work will be designed with a high speed for troop transport, with a close subdivision to make the ship safe, and with a large amount of stability so that the vessel will also be safe against turning over.

The war so far has developed, or called attention to three distinct types of vessels: The standardized or fabricated ship like both the English and the United States have adopted, the large troop transport which has been described, and in addition, the now quite familiar submarine chaser.

Government Will Tell All Men to Stay by Their Jobs

"I have been quoted recently in an extract that I gave of this talk to the newspapers as favoring the conscription of laboring men. I do not say that I favor the conscription of laboring men, but I do say this—that sooner or later the United States will tell all men who are essential in any industry or any occupation in the prosecution of the war that this is their job and they are to stay by it until the war is over. It is perfectly ridiculous that our men who are already in Europe and those who are going there now should for a minute suffer on account of some difficulties that arise between employers and employes in the great shipyards of this country. Not only should the man who pounds iron and drives rivets be told that he shall be kept on his job, but also every employe in the company, from the president down to the office boy, is to do the same thing, and he is not to seek or obtain other employment, except for good reason given the government authorities. It simply comes down to this: Whether we are playing a game of amusing ourselves, or whether we are in to win. If we are in the war to win, no one should be timid about telling the laboring man or the unions or anybody representing them just what part they have got

to play along with the part that other people should also play. In fact, when the war started a few of us in conversation with the secretary of the navy told him that we thought the thing for him to do was to commandeer the shipyards together with all their employes; to put us all on the government pay-roll if he wanted to do so, and give us as many stripes on our uniform as he thought proper, and if we did not do as he thought the United States wanted us to do to courtmartial us and send us down to Atlanta or some other convenient penitentiary. And I think something of that sort should be done. Any man who has charge of shipbuilding or engineering in any capacity who is not perfectly willing that that should be done both to himself personally as well as to his men, has a very one-sided view of this war which needs to be corrected. Of course, it is held by the national council of defense, and by a number of exalted bodies that the status quo as between employer and employe should remain the same during this war. Of course, it should remain the same, and we all know that it is not remaining the same, and we all know that the labor leaders as a rule are unable to control the men."

—Homer L. Ferguson.

also because the vessel may run away from the submarine in darkness or in daylight if she has a greater speed than the submarine has on the surface, and also because the vessel may be maneuvered much more quickly. One of the most gratifying things about submarine warfare is that the torpedoes are not making the speed as in the early days of the war. The speed of the torpedo has undoubtedly become much decreased. Just why we do not know, although it is probably due to the absence of tungsten and manganese and some other ingredients now so difficult to obtain in Germany. Vessels of 16 or 17 knots have actually dodged the torpedoes.

The vessel of 16 or 17 knots is also needed to carry soldiers. We are shipping all our soldiers to Europe in vessels of 14 knots or over because it is thought to be too hazardous

long ship a very much smaller proportion of that vessel is open to the sea. So that it is perfectly possible to design, and practical, indeed, to design, a ship of 500 or 600 feet long, so subdivided that it will take two and probably three torpedoes of the German variety and still stay afloat. The design, however, must be of such character that when the compartments are flooded the ship will still remain upright.

A number of vessels have been torpedoed and have been towed into port and repaired on the other side, even after the crews had deserted them. In fact there is a strong notion that the crews have been over-ready to desert the ships and have left when the ships were still afloat, which is proved by the fact that these ships have been towed in.

The larger type of ship which will probably be built before the war is

In addition to these three types of ships brought out by the war, there has been a very definite attempt to rejuvenate what some of us have considered a dead industry. I do not know whether there are many wooden ships building around Philadelphia or not, and I would not like to criticize the wooden ship builders; but I should like to see a few. We have a few of the older wooden-ship builders left but the building of a wooden vessel to my mind is so much more difficult than the building of a steel vessel and requires so much higher skill than does the building of a steel vessel, that I wonder how they can ever expect to build them.

I do not believe that a 288-foot wooden ship built in a lumber yard, either south, west or north, and necessarily by men who are not expert ship carpenters, will ever relieve any great distress on the other side of

the water, caused by lack of fuel or food. On the other hand, these vessels may be used in our own trade at home. My chief regret is that they are not made shorter, because when such ships are over 200 feet long it is rather difficult to hold the ends up. If we get more vessels through building wooden ships, let us build them, but it is unfortunate that the type was settled before many professional wooden-ship builders were on the job. The wooden-ship builders of course have taken a good many men from the steel shipyards and have lessened production to just that extent; but, on the other hand, they will add a very considerable tonnage, now that practically all our large coastwise ships are either going abroad or are in way of being commandeered for foreign service, so that the wooden ship will serve a useful purpose.

Standardization on the Lakes

The standard ship probably offers the best opportunity for a large increase in our tonnage. The standard ship has been built on the Great Lakes for years. Shipbuilding there has become largely a manufacturing operation for the reason that the ships themselves simply form a part of the manufacturer's business of carrying iron ore from Lake Superior down through the canal to the eastern points where it is shipped to the blast furnaces. The loading and unloading of the ore permitted the standardization of docks, hatches and so on, and the method of construction became standardized because the work which the ship did was standardized. Many ask why we do not build ships just like they do on the lakes, and the answer is that we do not do the same work that they do. On the coast, with the coal trade, there has been some effort toward standardization.

With the standardized ship the main benefit is not in the hull of the vessel or in the fabrication of the vessel in the steel mill. The main benefit is that the machinery and the outfit, the winches, the pumps, the steering gear, the engines and boilers and all the thousand and one things that go into the ship are standardized and may be produced in large quantities at some point other than the yard of the builder. The standardization of the fittings of a vessel is more important to my mind than the standardization of the hull. The amount of money saved in the latter will be the money to build the templets, patterns, etc., amounting to not more than 12½ to 15 per cent of the labor cost of the hull. We are told, too, that

all the riveting will be done at the steel mills. It probably will not and if 20 per cent is done it will be more than I think will be done unless the railroads will carry pieces of steel as large as this auditorium.

Shipyards have naturally tried to standardize within their own practice the fittings that go on the various ships they build, and a great step is being made in that direction by one of the largest corporations in the country. The Bethlehem company owns so many shipyards that they are in a position to standardize as between their various yards with the result that there will be considerable saving in cost and time in the production of all the things that go into a ship. But in building the standardized ship, or in building any other ship, the real problem is not the problem of equipment; it is not the problem of money even; it is not, except in part, the problem of location, but it is the problem of men. A very simple lesson in arithmetic will indicate that if 100,000 rivets are to be driven in one day and any one gang of riveters will drive 300, then it will take so many men and boys and helpers to get that drive. It is quite desirable to get back to our arithmetic again when we have built so many ambitious high hopes of what we expect to do. I can state for our company, the most fortunate thing we did when this war started was that we only promised to deliver ships of the quantity that we had been delivering before. In other words, we did not capitalize our noble purposes and high ambitions, and, I am very happy to say that we therefore only have about four more vessels on our hands for which we received a fixed price.

Where to Get the Men

Saying that we are going to do a thing does not do it, and hoping that we are does not do it, and promising to the newspapers that we are going to build all these ships does not do it. As a matter of fact, enthusiasm and high hopes, unless counterbalanced by good judgment and experience, do more harm than good, because a good many people are lured into a sense of security that we are going to win against this submarine menace, when, as a matter of fact, there is nothing to justify any such conclusion. For instance, on the Delaware and on the Chesapeake, which we, on the Chesapeake are pleased to consider the two largest shipbuilding communities in the United States, there are at present about 33,000 men employed in the shipyards. There could be employed to

advantage in these same yards at this time a total of 48,000 men, and within the next six months, or the next nine months at the latest, these same yards, barring the fabricated shipyards, could employ to advantage a total of 60,000 men. So the problem becomes arithmetical again. You have 32,000 men working. To get the maximum production out of the shipyards already in existence you will need to use 60,000 men. Where are the 28,000 extra trained shipbuilders to come from? Add to that the fabricated shipyards, which, on the Delaware will probably require 20,000 men, and in the vicinity of New York an extra 10,000 and we have in this immediate district need for approximately 60,000 new mechanics in the shipbuilding business.

According to Admiral Capps, there will be needed in the whole United States in shipbuilding within the next six months an additional 150,000 men. Now, consider for a minute where these men must come from or how we are to get them. In the first place, most shipbuilding men or mechanics require both skill and experience. We can give them the experience fairly quickly, but we have not time to give them the skill. In other words, it is necessary that men be recruited from industries where they do work similar to the work of shipbuilding in order that they may become quickly adapted to the work of shipbuilding. I say other industries without specifying what particular industry. Of course, it would be natural to pick the non-essential industries if there are any such. But I would say that they should be taken from any other industry, if necessary, because our problem in the war becomes the most difficult when the question of transportation is considered.

There is a solution of this labor problem effected with the transport workers on the other side; Liverpool, for instance. A number of the soldiers were sent back to Liverpool and went to work. You will remember a few years ago in France a great threatened strike on the railroads was settled by making soldiers out of all the railroad employees. Our present stevedore troubles are in a fair way of being settled by giving the colored man a chance to be a stevedore instead of being a soldier in the trenches and so far as I have been able to observe in our neighborhood, several thousand of them are glad to take advantage of this glorious opportunity and are stevedoring for their country very quietly and very effectively, and I do not see why

of all the men who have been passed into the national army that we should not have in as essential an industry as shipbuilding those of them who are mechanics on conditions set by the government and on pay to be approved by the government, to work in these shipyards until the war is over, or until they should perchance prefer to go to the front instead of staying in the shipyards.

I understand that in Philadelphia it is very difficult to have any of the shipyard employes excused from military service. Of course they have their own rules to go by in Washington, and we must all abide by them, but it is rather unfortunate that they should be differently interpreted in different parts of the country and it seems to me most unfortunate that the shipbuilders have been allowed to go to the front. The experience of England was that they had to take out of the trenches not only the shipyard workers but the ammunition workers and send them back to the factories again. It is a pity that we could not profit by that, but I suppose we will after we have gone a little further into the war. That would be a solution that would help very much with this laboring man difficulty.

Of course the real trouble with the employers of labor is they are told that they must get together with the men and must have no trouble during this war; that they must keep the plant going. Every manager that I have talked with feels that it is incumbent on him as a good American to see that the wheels are kept going around and that these ships are produced. The demand is largely in excess of the supply of men. The sympathy of the government is with the men. At our navy yard under the law we pay the going rate in that vicinity and arbitrarily fix the rate higher than the going rate in the vicinity which we have to meet, and we are told in case of difficulty we must keep going, so it is only a question that can be worked out by the government's representatives and the shipyard employers together.

I was shown today in the case of a number of workers that the money which they could earn in a day was limited by the organization to which they belonged, and that if they earned that much money at 2 or 3 o'clock in the afternoon they would work no more, notwithstanding the fact that the management wanted them to do it. When will people ever learn that production by the use of labor-saving machinery to get a large pro-

duction per man is all that gives us more than we ever would have otherwise or than we ever would have had before the days of large production?

And yet they have limited production with the idea of giving more jobs to more men in time of war when we have not got enough men and have about three jobs for one man!

I will take just a little bit of your time in presenting what I might say

Must Employ New Men

"I would be perfectly willing to see all the shipbuilders go down to the navy department and shipping board and say, 'We will agree with you on these conditions and stand by them and will shut up our shop before we pay any more.' Of course, it can be said that a man who works is entitled to any wage he can get. Perhaps he is, but he is not entitled to stop working now, and he is not entitled to say that any other man shall not serve an apprenticeship now. He is not entitled to say that a helper shall not do a mechanic's work if he can do it. How perfectly ridiculous when a million and a half of the best young men that we have in the whole United States are serving an apprenticeship in the war, leaving their homes and going out to learn the art of soldiering in a very short time, and quite as difficult work to learn as riveting. What a ridiculous thing to say at a time like this that a man cannot get a job unless he has served his time at the trade, and tie the hands of the United States in this great war, which it must win if you and I are going to keep on being proud of living in the United States."—Homer L. Ferguson.

is the worker's side of the story. I do not know the conditions in Philadelphia, but I imagine they are rather bad for laboring men. As an instance of what can happen, in Newport News, a town ordinarily of 30,000 people, we now have 55,000 people. The place is so full of people that no one can even go there to see the soldiers off. The condition of laboring men who are gradually coming in from the west to all the seaboard towns is a very difficult one, and a great deal of the basis of discontent is a lack of suitable housing conditions. That is ordinarily taken care of in the towns and cities by real estate people and those who build for investment, but at the present time that method is wholly inadequate, and

this question will have to be considered along with the same program as that for our army which is being installed in cantonments all over the United States. Why? Because we cannot find vacant houses for 20,000, 30,000 or 40,000 men in any one place; and so quarters have to be provided the same as for the soldiers. This new population is fitted to do more work, to do shipbuilding and build munitions or guns, and it is therefore necessary that it be brought from elsewhere and be not literally dumped on a community already overcrowded, but that proper living conditions and houses be provided at once. The government is waking up to this in the case of some recent contracts let for destroyers. The government itself will finance the building of barracks or temporary hotels for the men, so that several hundred can be housed at or near the shipyards where the work is to be done.

One of the biggest problems England had was the formation of new communities and the building of whole towns. In some cases, they were almost 10 miles square, and in them were provided not only ordinary houses and living accommodations, but public parks, playgrounds, theaters and everything needed in a modern town.

I have not intended to make a patriotic talk; it was supposed to be more or less of a technical talk, yet it all comes back to the question of men and willing men—willing to do work under conditions which their own government and our own representatives say are fair and honorable both to the government and to the men, and I say that if they will not work under conditions such as the government specifies and at the rates of pay which the government calls fair, then they should either be made to, or made to let alone men who are willing to do so.

I cannot imagine the United States letting stand in its way any band of men whatever when the national honor and national life, in fact, depends on our winning this war, and when we are sending forth our young men and boys by the thousands to France.

As a business man, I do not know of any man in the shipbuilding business who would care, and I, myself, do not care, how much of my income the government takes, as long as it treats everybody else the same, and as long as the business is left with enough money to carry on its operations and pay a most moderate return to the owner and be able to serve the government in the best way. I

do not care how much of the profit of the business they take, and I will go further than that. If it becomes necessary for the raising of money, a conscription of capital would not hurt my feelings at all. The importance of beating the Germans is so paramount that any or all of these methods may be used. The chamber of commerce of the United States at Atlantic City a very short time ago, representing many business men in the United States, gave voice to this sentiment: that if they treat us all alike they could not go too far in exacting the greatest toll from the business of the United States. We are willing, if necessary, to have the plants commandeered by the government, under the terms of the United States and under conditions which they see fit to impose, but we do insist that managers, foremen, superintendents and men shall all be treated alike.

Who Gets Steel First?

The important question of priority and preference is now the biggest industrial question there is, for the very simple reason that the total production of the United States has been over-absorbed by these war activities.

With the prices settled, the only important thing is, who gets his first, who second and who third. We have in the war department six bureaus buying frequently in competition with each other. We have in the navy department five or six bureaus buying, or recommending to buy, not in competition with each other very much, but somewhat. In the shipping board we have a tremendous amount of buying going along more or less in competition with the war department and the navy department. The government simply wants to get the material in such quantities as it can, but it is simply impossible to satisfy all these bureaus and departments. What is the answer?

The answer that has been found in Great Britain in the very first months of the war was to divorce the question of business, buying and price fixing from the naval and military activities of the country. A munitions minister was appointed; just the kind that we need. The same chamber of commerce I was speaking of recommended that a board be appointed. I am a director in that chamber, but I think a minister should be appointed, because you want a man who will co-ordinate the interests of the country, and when blankets are necessary he will buy blankets for the United States, and

not buy three blankets for the sailors and none for the soldiers. In shipbuilding, in munitions production, and in arming and sending soldiers across to the other side, we have a great problem to meet. What have we in our country? We have great army cantonments. We have great army and navy orders from the government and are competing day after day;

Rivets Are Rivets

"There is an idea extant that if a ship is called 'fabricated' or 'standardized' it becomes rather easy to build. It does become easier to build, but it is not any easier to drive a rivet in a fabricated ship than in a common ship, and the 7500-ton fabricated ship will have about 650,000 rivets and some riveters must do a considerable amount of work to drive those rivets in that ship the same as in any other ship. The most onerous work in building a ship is in the driving of the rivets; and, if any concern is going to build one ship a week, it must drive 650,000 rivets a week. When we consider that the best rivet drive is by the Union Iron Works Co., where they drive 250,000 rivets a week and the next best by the three largest shipyards on this coast is about 200,000 rivets each per week, the problem of driving 650,000 rivets a week assumes a rather difficult aspect to the casual observer. Still, we all hope it will be done, but if it is done it means the importation of an enormous number of new workers into the industry."—Homer L. Ferguson.

we do not know who is first, second or third. I am sure that the secretary of the navy and the secretary of war have both plenty to do to run the operations of their great departments without working a large part of the time with the question of buying, and whether they are going to get this first, second or third. We have a priority committee, but they cannot settle it, but only recommend it. Actually, the best buying is done by the official who is the most zealous, so that we run great risk, if that keeps on, of having our soldiers on the other side with plenty of guns and muskets and maybe gunpowder, but not enough baked beans or peas or something that they need. It must be done in some way so as to least upset the country.

Another reason that business should go on as well as possible is because

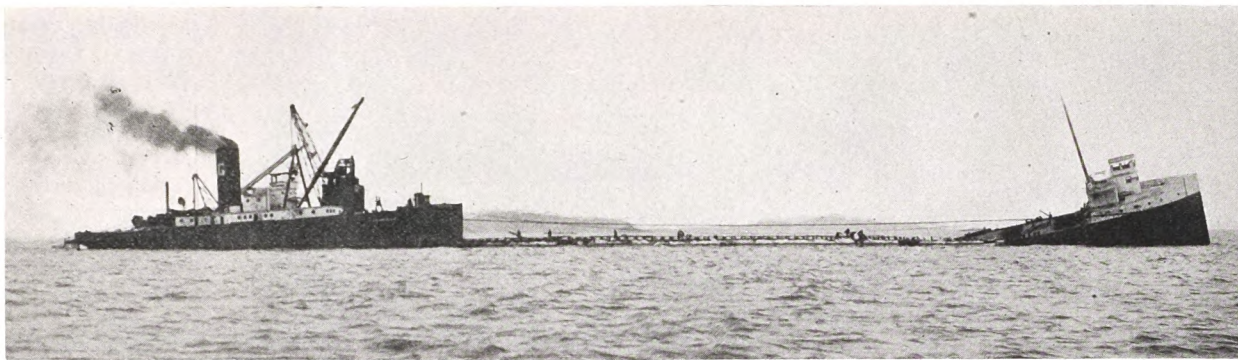
we have to earn some money somehow in order to meet the war taxes.

The weakest point in the shipbuilding business is the forging situation in my judgment. There are not enough forges in the United States to turn out all the forgings required for the shipbuilding. The great Bethlehem company, Midvale, and Allis-Chalmers are practically the only large ones we have, whereas Great Britain has 12 or 15 very respectable forging concerns. It is absolutely necessary that someone determine whether this or that or the other kind of forgings shall be first; otherwise a lot of us are apt to end up with hulls but no machinery in them. It seems to me that we all want to do the best we can, but we would very much appreciate it if we could go to Washington and say to some one that this is the most important, and that is the next, and that is the next. Instead of that, we appeal from one department to another and frequently end up with nothing.

What Congress Must Do

I am mentioning this to you because it is very much in my heart and mind; I see it in Washington every time I go there, and I hope very much that next winter when the question comes up in congress they will see fit to do this instead of scattering the work among the navy department and the war department and the shipping board.

We all know that it is a joy to have a few good mechanics and give them a job and forget about it, but we have to get away from that and to teach new people, which may fortunately be done with ships of standard make and duplicate makes. The biggest problem that the employment managers have at the present time is to get hold of the best material possible, house it as decently as we can, and teach it shipbuilding as quickly as possible. The problem almost dazes one to contemplate. It can only be solved by bringing in enormous quantities of new men, and which must be done without any hindrance. The leaders of the unions have stated that they would allow this to be done. We have to do it, and no matter what else happens we must insist upon the right to break in any number of new men in the business. The shipping board will back it up, and I am sure that sooner or later the administration itself will insist upon that being done on such a comprehensive scale as to make it possible for the United States to carry out its great shipbuilding program, which must be carried out.



Salved After Two Years on Rocks

Remarkable Feat of Rescuing Lake Boat in Upper Lake Huron

WITHIN a few days the repairing of the lake steamer, *WESTERN STAR*, will be started at the Toledo, O., drydocks, marking the closing chapter of one of the most interesting stories of salvage in the history of the Great Lakes. For almost two years the vessel hung on Robertson's rock in Georgian bay, Lake Huron, exposed to all conditions of weather and defying all efforts to release her. Her rescue a few weeks ago was a feat of salvage which many vessel men had regarded as impossible. The successful accomplishment marks the distinct progress which has been made in salvage work.

The story opens on the morning of Sept. 24, 1915, when the *WESTERN STAR*, while steaming up the north channel of Georgian bay with 7000 tons of coal for Little Rock, Ont., was brought up on Robertson's rock, near Clapperton island. The ship settled at an acute angle with her bow in 5 feet of water and her stern covered with 85 feet of water. Only 40 feet of her bow showed above the surface. She was in command of Capt. B. J. Sloan, and he, with the other officers and the crew of 20, reached the shore in safety.

The Cadillac Steamship Co., owner of the vessel, upon examining the wreck, abandoned it to the underwriters, who subsequently awarded the salvaging contract to the Great Lakes Towing Co., Cleveland, O.

Early in the following winter the task of reclaiming the vessel was begun. The

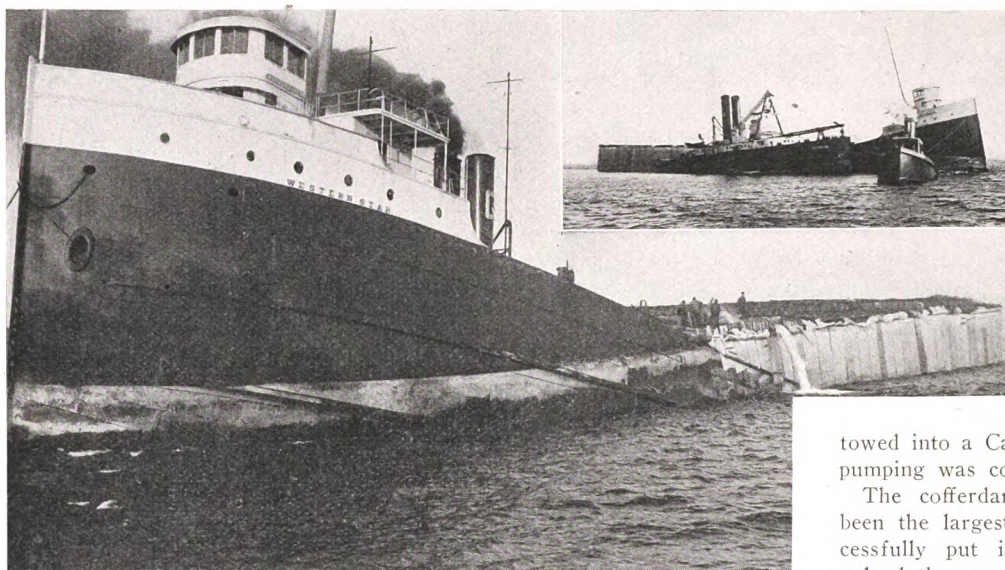
construction of a cofferdam through the ice was started and hurried to completion. However, when all was in readiness and the steam pumps were started, the dam collapsed and the work of weeks was undone. Upon examination it was discovered that the unseasoned timbers used had not been able to withstand the enormous water pressure.

Despite this accident and the numerous predictions that the job was doomed to certain failure, the Great Lakes Towing Co. immediately set about planning the construction of a new cofferdam. However, owing to inability to obtain proper construction material, the company temporarily abandoned the work. In June of this year, with the wrecker *FAVORITE* and the lighter *T. F. NEWMAN* loaded with timbers and other construction material, the wreckers again returned to the stranded vessel. Heavy timbers, varying in length from 10 to 62 feet, were let down and riveted to the gunnel bar. These timbers were supported on the outside by a 1-inch facing and over this facing was spread a water-

Cofferdam Required Was Largest of Its Kind Ever Erected

tight canvas jacket. A stringer, 12 inches square, was run around the top of the timbers on either side. Deck beams were placed across the top and sawbucks were placed throughout the interior at intervals of 14 feet. After several weeks, when the cofferdam was nearing completion, a northwest gale swept over Georgian bay, and once more the cofferdam had to be





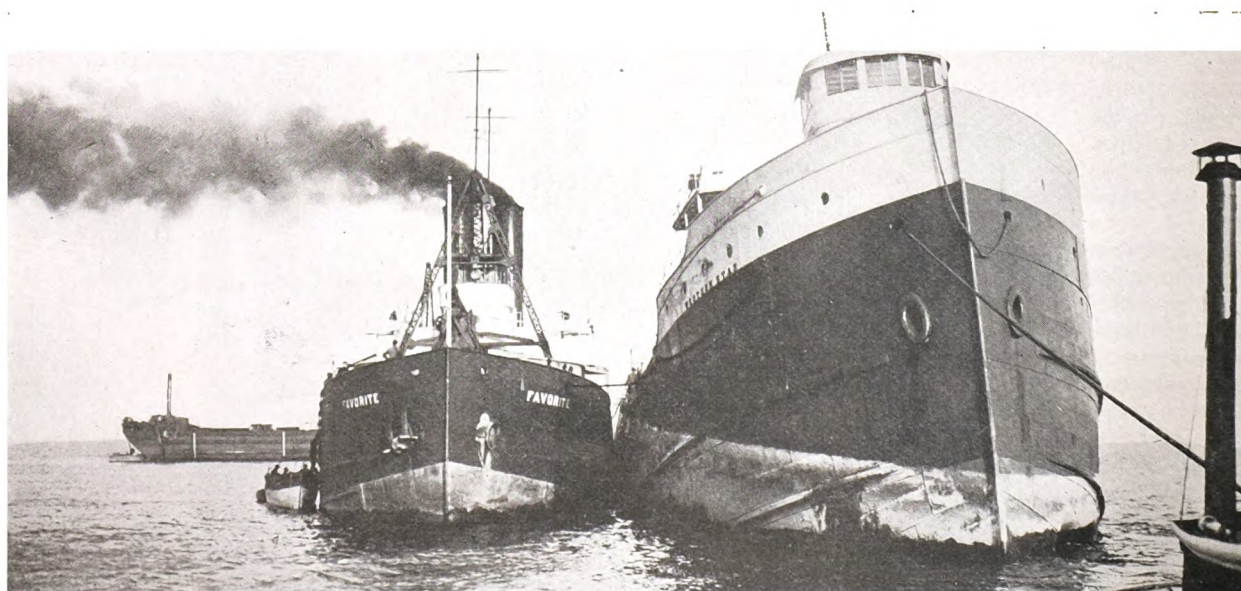
practically reconstructed. Favored by good weather, the work upon being resumed the third time, was rapidly pushed to completion. With the pumps working, the redesigned cofferdam was amply able to withstand the water pressure and on Sept. 18 the vessel was

towed into a Canadian port, where the pumping was concluded.

The cofferdam is believed to have been the largest of its kind ever successfully put into operation. It involved the use of 430,000 feet of timber, 222,000 square yards of canvas and 73 tons of strut rods.

The WESTERN STAR was constructed at the Wyandotte yard of the Detroit Shipbuilding Co. in 1903. She is a steel ship of 4764 gross tons, 416 feet in length, 50 feet width and 26 feet depth. The steamer was originally built for the late M. J. Cummings, Oswego, N. Y. In 1913, several Detroit interests organized the Cadillac Steamship Co., which purchased the ship. The underwriters, who had taken over the vessel following the accident in Georgian bay, recently sold the ship to the Valley Camp Steamship Co.

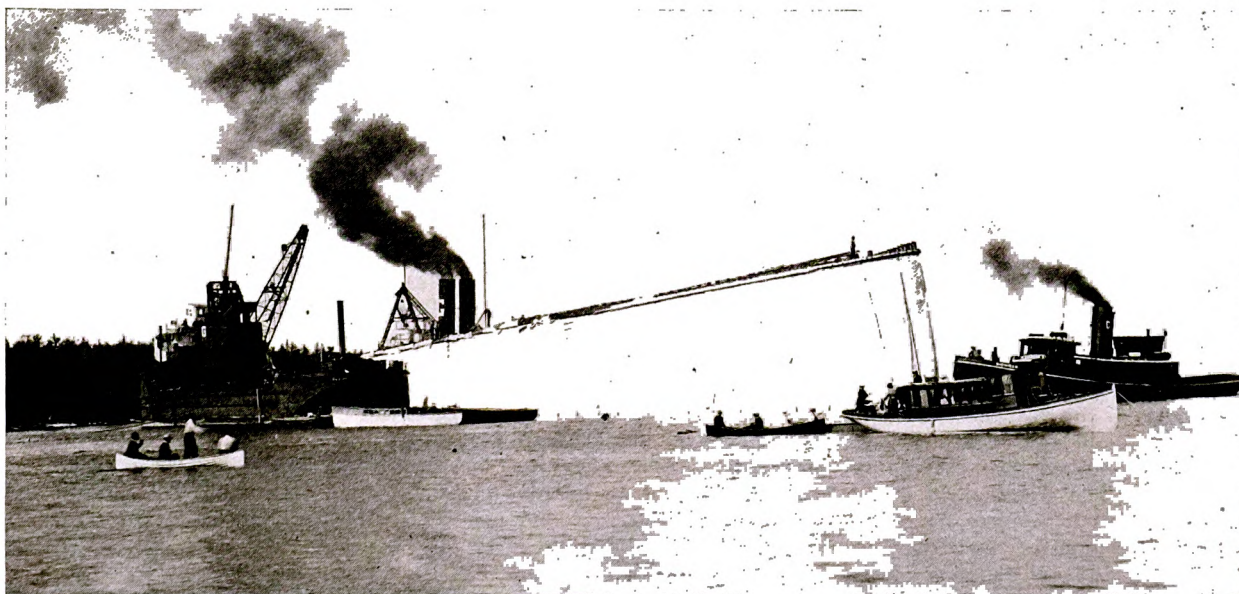
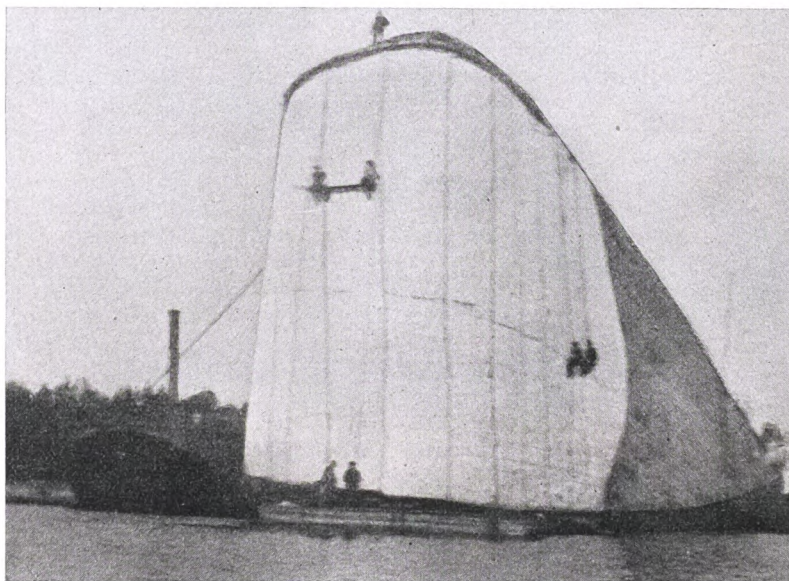
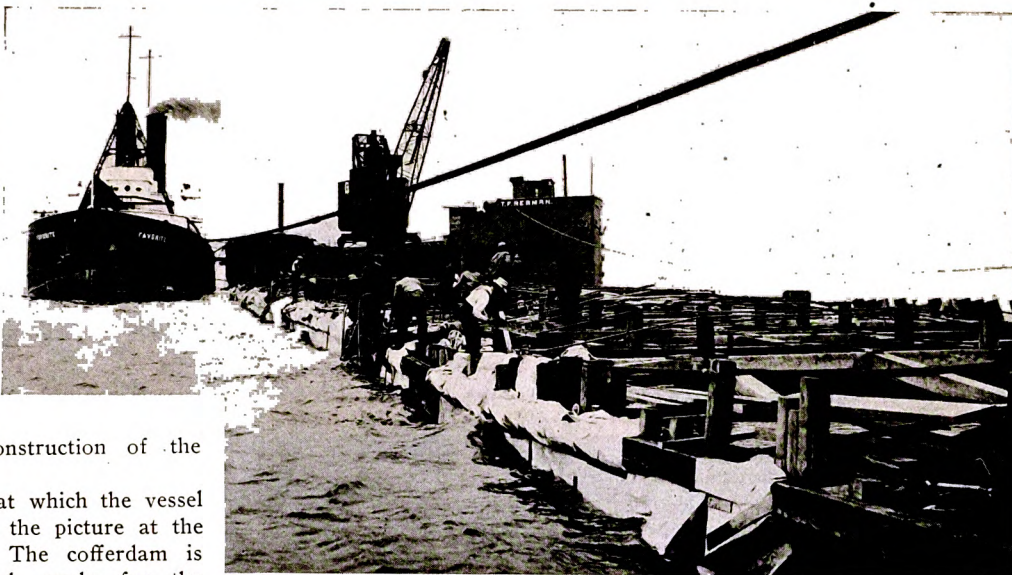
Although the vessel was on the rocks for almost two years, her value during that period increased considerably. The boat at the time of the wreck was insured for \$240,000, while recently she was bought



for \$358,000 by the Valley Camp Steamship Co., which will spend an additional sum of \$150,000 to \$200,000 for repairs.

The accompanying pictures show the WESTERN STAR as she hung on Robertson's rock and during the successive stages of progress in the construction of the cofferdam.

The acute angle at which the vessel settled is shown in the picture at the top of page 427. The cofferdam is shown as completed, ready for the pumps. In the photograph at the bottom of the same page, may be seen the construction of the cofferdam at the stern. On the following page at the top, the WESTERN STAR is shown just afloat, being towed into shelter. The vessel is drawing 5 feet forward and 75 feet aft. The smaller photograph is another view taken at the same period of progress. The picture in the center shows the construction of the cofferdam looking down on the work. A close-up view of the vessel while being towed into the harbor is shown at the bottom. The picture at the top of this page shows the last piece of canvas being put into place. At the bottom of the page the photograph shows the vessel in shelter, with the cofferdam partially pumped out. The photograph directly above shows the work upon completion with the full 62 feet of cofferdam at the stern.



What the Government is Doing

Rulings on Marine Matters

Improvements to Waterways

Hints to Navigators

U. S. Board Fixes Minimum Wage Scale

UNIFORM minimum wage scales for the Pacific coast shipbuilding yards, which are to serve as a guide for all shipyards in the country, were announced Nov. 4 by the United States shipbuilding labor adjustment board, according to advices from San Francisco. The decision effects an increase of 10 to 30 per cent over the old scale on the coast, although its uniformity makes it lower in some localities than the temporary scale now in force.

The decision, the first to be handed down by the board, declares that employees' "discrimination, interfering with the defense of the nation in time of war, against so-called 'unfair' materials, would be intolerable".

"There won't be many ships built under this scale," declared M. J. Maguire, a union conferee representing the metal trades craftsmen of the bay district. "I believe the entire shipbuilding crafts on the Pacific coast will appeal to Wilson against the decision."

The scales were based on the increase in the cost of living since the beginning of the war, it was stated.

Seventy-five thousand men must be employed in the Pacific coast shipyards to carry out the government's program, the board decided. That means 30,000 skilled mechanics more than are employed now. The board will urge the department of labor to extend the federal employment service in California, Oregon and Washington to supplement the trade unions unable to supply skilled workmen.

Employers' and Employees' Duty

"The shipbuilding labor adjustment board is a war board," the decision states. "The owners of the shipyards are, for the duration of the war, merely agents of the government. Employers and employees must realize the war has changed their relations to each other. The government is insistent that ships it requires must be built and built promptly. It is equally insistent that standards of living must be preserved.

"The national program requires an increase in the output of ships from

750,000 tons turned out in 1915 to 6,000,000 tons in 1918. This necessitates introduction wherever possible of the two and three-shift systems. Immediate steps to bring about this change must be taken by shipyard owners. The board urges representatives of organized labor and employers concerned to work out in co-operation with agents of the government plans for the more rapid training of skilled workers in the different crafts."

Summarizing the decision, Henry A. Seager, secretary of the board, said:

"The board did not feel justified in forcing on the taxpayers of the country, who henceforth must pay for the ships built, the higher wage that the consideration of merely local aspects of the situation might have warranted. It urges employers and employees to accept the decision in the spirit of loyal co-operation and do their utmost to help the government win the war by turning out the ships so urgently required."

Labor Leaders in Session

Representatives of the craftsmen met in secret conference after the decision. The decision of the board was reported to be unfavorable to them. Maguire, adding to his declaration that an appeal to the President would be made, said:

"I do not believe the men will leave their jobs. I believe organized labor will be found patriotic enough to hold its ranks to the work until the President has ample time to review its appeal and decide upon it.

"The representatives of labor here will return to their respective homes and the unions will vote upon the new scale. The scale means an increase for the majority of workers over their old scale, but in Seattle there are 6000 men who will receive less under this scale than they are getting now. To others the increase is very slight. The board found living costs had increased 36 per cent. The men want enough to meet this."

The scale rates are retroactive, going back in the Puget Sound district to Aug. 1. They must be put into effect on or before Monday, Nov. 12,

the board ordered, and back pay must be paid within two weeks from that time. Rates of wages now being paid in excess of the minimum rates fixed are to be in no wise altered.

An eight-hour day was fixed for the San Francisco and Portland district. Working conditions in the Puget Sound district are to be determined by agreement by employers and employees.

The Wage Scale

The minimum uniform scale for the Pacific coast was fixed as follows:

Journeymen machinists, molders, blacksmiths, anglesmiths, pipe fitters, boilermakers, ship fitters, pressmen, angle and frame setters, riveters, chip-pers and caulkers, acetylene workers, and electrical workers, \$5.25 a day.

Painters and plate hangers, \$5.

Sheet metal workers, coppersmiths and flange turners, \$6.

Heaters, foundry carpenters, furnace men and punch and shear men, \$4.50.

Patternmakers, \$6.50.

Planer men, counter-sinkers, drillers and reamers and holders, \$4.20.

Machinist specialist, \$4.

Rivet heaters, \$3.15.

Laborers, \$3.25.

Helpers are divided into two classes, as follows:

Machinist, pipe fitters, sheet metal workers, ship fitters, electrical workers, molders, helpers, \$3.60.

Blacksmiths, coppersmiths, slab, plate hangers, hook tenders, flange fire and machine helpers, and casting cleaners, \$3.90.

In yards where wooden ships are being constructed the minimum rate for caulkers is fixed at \$6.50, shipwrights, joiners, boatbuilders and millmen, \$6, and laborers and helpers, \$3.25.

The Union Iron Works, San Francisco, will now have increased facilities for building the 40 torpedo boat destroyers contracted for by the navy department, since the government has commandeered the Risdon Iron Works. The Risdon plant, which is directly south of the Potrero plant of the Union Iron Works, comprises 30 acres of

land and eight shipbuilding slips. Machine shops, fabricating shops and other buildings will be erected and the slips will be put in condition to handle two destroyer frames each.

Successful Radio School

A free government school to train radio operators for the rapidly growing American merchant marine has been established at Boston through the initiative of Arthur Batcheller, radio inspector, of that city, with the active assistance of Walter Butterworth, assistant radio inspector. When congress made its first appropriation for building merchant vessels Mr. Batcheller, at that time assistant radio inspector at Boston, was quick to realize that a large number of commercial operators would be needed, and in June he suggested to the commissioner of navigation the establishment of a free school which, unlike the great school conducted by the navy department, would accept only such applicants as would agree to take a position in the merchant marine. The suggestion was approved and Mr. Batcheller was authorized to carry out his plans.

Through the co-operation of the collector of customs, permission was obtained to use the office of the radio inspector in the Boston custom house during the evening for school purposes. Benches and tables were made from second-hand lumber obtained through the assistance of the customs service, and camp stools were loaned by the Boston & Gloucester Steamship Co. Through the mayor of Boston the loan of a blackboard was secured from the school department. The Marconi Wireless Telegraph Co. aided the project by supplying a typical radio installation, and the bureau of navigation furnished the necessary head telephones, telegraph keys, dry cells, wire, buzzers, etc.

These facilities permitted the instruction of a class of 40 men, and nearly that number are taking advantage of the opportunity. The classes meet three evenings a week and the work is progressing with marked success. The school opened on July 16, and each student will have an opportunity at the end of a six months' course to win a first-grade commercial radio operator's license. Mr. Batcheller had previously had four years' experience as a teacher of electricity and radiotelegraphy.

Warren Johnson, representative for the New Orleans district of the Emergency Fleet corporation, states that it will be three or four months before the first wooden vessel built under a shipping board contract would be completed in that section.

To Train 10,000 Officers

WITH a view to perfecting details connected with the work of training officers for the ships of the new merchant marine, a conference of officials of the United States shipping board recruiting service was held in Boston, Oct. 26 and 27. This recruiting service began its work in a small way last May and has grown to be an important arm of the shipping board's varied activities. At present it is engaged in training deck officers and marine engineers, at 27

accepted for taking the instruction.

At present not less than 350 students are being trained in each 6-week term of the navigation schools, and not less than 275 students in each term of one month in the engineering schools.

The recruiting service of the shipping board is conducted largely by volunteers, men of business training with an interest in seafaring matters, who are giving their time to the government. Henry Howard, Boston, who originated the training plan, and was appointed



MEN WHO ARE RECRUITING 10,000 OFFICERS

Front Row, left to right: Prof. Carl C. Thomas, Johns Hopkins University, Baltimore; Eugene E. O'Donnell, Supervising Inspector Fifth District, Steamboat-Inspection Service; Henry Howard, Director of Recruiting, U. S. Shipping Board; Capt. Irving L. Evans, Cleveland; William J. Grambs, Seattle; Farnham P. Griffiths, San Francisco.

Second Row: Dean Alfred E. Burton, Massachusetts Institute of Technology; W. Marriott Welch, assistant to Director of Recruiting; Henry G. Vaughan, Sea Service Bureau; Edward C. Hovey, Chief, Sea Service Bureau; Edward F. Flynn, Assistant to Director of Recruiting; G. Maurice Congdon, Providence, R. I.

Back Row: Winfield M. Thompson, Field Agent, Recruiting Service; Prof. Edward F. Miller, Marine Engineering Department, Massachusetts Institute of Technology; James J. Raftery, President, George A. Willey, Business Manager, Marine Engineers' Beneficial Association.

free navigation schools and eight free engineering schools. Not less than 12,800 deck and engineer officers will be needed for the 1600 ships called for under the shipping board's present construction plans. A majority of these ships will take the water in 1918.

It is expected that the experienced, seasoned men now in the merchant service will be sufficient to take the senior posts on the new ships. The shipping board's schools are therefore devoted to training a sufficient number to fill out the complements thus started. The service is prepared to train not less than 10,000 men for this purpose. Only men qualified to meet the requirements of the steamboat-inspection service as to experience are accepted for training, except in the case of specially qualified men. In no case are inexperienced men

director of recruiting for the shipping board on May 29, is the head of the Merrimac Chemical Co., and a member of the council of national defense acid committee.

While the Boston conference was devoted chiefly to the details of working plans for enrolling and training men and placing them in sea service afterward, consideration was given to several matters of general policy. The substance of the reports of the section chiefs was that there is a genuine revival of interest in the merchant marine all over the country.

"Use the Waterways and Win the War" is to be the slogan at the fourteenth annual convention of the National River and Harbors congress in Washington Dec. 5-6-7. The fundamental

purpose of the convention will be, not to urge appropriations for new projects, but to bring about the co-operation of the government, cities and people of the United States in placing the water-

ways of the country in the best possible condition to facilitate the tremendous traffic occasioned by war. It is thought that much can be done toward supplementing the work of the railroads,

whose capacity is already more than taxed to the limit. An interesting program has been prepared and the largest meeting in the history of the organization is expected.

Revised Specifications For U. S. Boilers

REVISED specifications for marine watertube boilers have been announced by the United States Shipping Board Emergency Fleet Corp. The boiler, according to the general requirements, will be of the marine watertube, crossdrum type with straight tubes expanded into continuous stayed steel-plate benders, in accordance with the following specifications: Working pressure, 200 pounds gage; hydrostatic test pressure, 400 pounds gage; grate surface, 77.5 square feet; total heating surface, approximately 2500 square feet; 89 straight tubes, $\frac{3}{4}$ inches in diameter, 7 feet $9\frac{1}{2}$ inches long, No. 9 B. W. G.; 299 tubes of similar dimensions, but No. 10 B. W. G.; 11 bent tubes, 3 inches in diameter, about 6 feet 5 inches long, No. 10 B. W. G.; and 10 bent tubes, 3 inches in diameter, approximately 6 feet 4 inches long, No. 10 B. W. G.

The boiler, which will be fitted with an induced-draft system, is designed to evaporate 15,000 pounds of water per hour, with feed at 200 degrees Fahr. when burning about 20 pounds of semibituminous coal per square foot of grate.

The detailed, revised specifications, in part are as follows:

Tubes

Tubes shall be hot rolled, seamless, steel, 3-inch outside diameter, of No. 9 and No. 10 B. W. G.; all tubes to be straight except the two top rows which shall be bent to 30-inch radius near the back header. The ends of all tubes shall be flared not less than $\frac{1}{4}$ inch over the diameter of the tube hole and shall project through the tube sheets not less than $\frac{1}{4}$ inch nor more than $\frac{1}{2}$ inch before flaring.

Headers

Headers shall be constructed entirely of open-hearth steel plates and shall be stayed with hollow bolts, screwed in place and the ends riveted over as directed.

Drum

The steam drum will be 42 inches inside diameter, of open-hearth steel plate, made in one length, with longitudinal seam butted and strapped inside and outside, and riveted as shown, the butt straps to be formed under pressure to the proper curvature of the drum before assembling for riveting.

The drum heads will be made from $\frac{5}{8}$ inch plates, spherically bumped under pressure and edges turned off true. The radius of the bump will be equal to the diameter of the drum. One head will be solid; the other head will have a 11 x 15-inch elliptical manhole flanged in and faced, and will be properly reinforced by a shrunk-on plate, of the

same depth as the flanging, conforming to the shape and curve of the manhole as shown. To avoid grooving, the flanging shall be well rounded at the bend.

Holes shall be cut through the bottom of the drum and reinforcing plate as shown, for the circulation of water to the front header. The cutting of these holes with the torch shall not be allowed. The top of front header shall be connected to a flanged throat plate riveted to the drum by swell neck rivets.

Drilling, Riveting and Caulking

Pilot holes for rivets, not to exceed 75 per cent of the diameter of the full size finished hole, may be punched on outer plates only, such as outside drum butt strap, circumferential laps at drum's ends, pressed steel nozzles for main steam and safety valves, throat plate and tube and hand-hole sheets (except top row of rivets on front header). No punching shall be allowed on inner seams, with the exception of the few holes necessary for setting up bolts.

All drilling and reaming for rivet holes shall be done from the outside after plates are assembled; then the plates shall be taken apart, all burrs removed, oil cleaned off, and plates reassembled, metal to metal, using a sufficient number of parallel turned bolts fitting the holes to insure their accurate alignment before riveting. The use of drift pins will not be allowed.

To insure a well proportioned rivet point, rivets shall be of sufficient length to completely fill the rivet holes and form a head equal in strength to the body of the rivet. Rivet holes shall be slightly countersunk in order to form a fillet at point and head.

Bulld rivets shall be used where possible, particularly for joints adjacent to the fire, and shall be driven at a cherry red heat and held in bulging machine until cold.

Air riveting, if used, shall be done at practically uniform pressure.

All rivets and stay bolts shall be set up tight in a careful and workmanlike manner, and all joints throughout will be carefully caulked watertight on the outside without excessive caulking. Inside caulking will be allowed only at the discretion of the corporation's inspector.

Edges of plates shall be planed for caulking, and chipping of edges shall be avoided as much as possible. Shearing to not less than $\frac{1}{4}$ inch of net dimensions will be allowed, but the remainder shall be finished by planing.

Holes for screw stays shall be fair and true and tapped full thread, after headers are assembled.

Holes for tubes will be preferably cut full size from the solid plate, but centers or guide holes, not to exceed 75 per cent of the diameter of the full-sized hole, may be punched; the remainder shall be cleanly cut, drilled, or reamed to full size.

No bolts will be used for any purpose passing through the shell of drum or header plates.

Connections to Drum

The drum shall have two pressed steel nozzles for main steam and safety valves and all other openings in the shell shall have forged steel pads. All nozzles and pads shall

be formed to the exact curvature of the drum before riveting, and shall be drilled and tapped for studs to suit "American Standard" extra heavy flanged valves and fittings.

Internal Fittings of Drum

The drum shall have a steel dry pipe, perforated on its upper side with saw cuts aggregating $1\frac{1}{2}$ times the area of the pipe. Dry pipe shall be supported by two straps and a standard cast iron tee, and shall be held in place with $1\frac{1}{2}$ -inch set screws. Tee shall be secured to the drum shell by an expanded nipple.

The boiler feed connections shall be arranged with an internal feed pipe having drilled holes of an aggregate area 50 per cent in excess of the area of feed pipe and the end of pipe will be capped and supported by a bracket.

There shall be one $1\frac{1}{2}$ -inch surface blow connection fitted with a scum pan. Both internal feed and blow pipes will be screwed in the holes of their supporting pads.

The drum shall have two wash plates and a hinged baffle plate built in sections.

Zinc Plates and Baskets

Sixteen zinc plates, 12 x 6 x $\frac{1}{2}$ inch thick will be fitted in the drum. They will be contained in a steel plate basket, for catching disintegrated zinc, having perforated sides. Each zinc plate will be supported by two $\frac{3}{8}$ -inch bolts filed bright and forced in plate to secure proper metallic contact, supporting bolts and metal, where they come in contact with basket, shall also be filed bright before zincs are secured in position, after which the joints shall be well painted.

Casing

The lower casing shall be constructed of steel plates and shapes, designed to be readily disassembled for shipment.

The casing shall part along a plane parallel to the inclination of the tubes and be so formed as to provide a support for the front and back headers as shown.

The ash pan shall be built of steel plates made in sections for easy removal, with edges of plates flanged for bolting together.

The furnace shall be lined with special fire blocks, 9 x 9 x 6 inches, secured to the casing as directed. A thin coating of an approved high-pressure cement shall be interposed between butts and successive layers of bricks. There shall be $2\frac{1}{2}$ inches of approved insulating material between the brick lining and the casing.

The upper casing shall be made of steel plates and shapes arranged as shown. The sloping sides of the boiler shall be lined with $2\frac{1}{2}$ inch standard fire bricks resting on the outer tubes and $2\frac{1}{2}$ inches of approved insulating material.

The casing shall be built in panels, bolted together. All bolts for assembling on shipboard shall be shipped with the plates. The roof shall be built of double steel plates properly supported with angles and brackets as shown and insulated with $2\frac{1}{2}$ inches of approved material.

The steam drum shall have 2 inches of approved insulating material held in place by poultry wire, lined with $\frac{1}{2}$ inch of plas-

magnesia on the outside, neatly worked around all pads and manhole opening.

Baffles

Baffles shall consist of tiles, except the top ball baffle, which shall consist of $\frac{3}{4}$ -inch steel plates properly held in place.

The lower baffle tiles shall be held in

place, at a distance of about 6 inches from the front header, by cast iron distance pieces. The middle baffle tiles shall be prevented from sliding by cross bars of cast iron.

Boiler Fittings

Each boiler will be provided with the following fittings: One 3-inch duplex safety

valve; one double spring steam gage; two $\frac{3}{4}$ -inch glass water gages, quick closing type; three gage cocks; two 2-inch globe stop valves for main and auxiliary feeds; two 2-inch angle check valves for main and auxiliary feeds; one $1\frac{1}{2}$ -inch bottom blow valve; one $1\frac{1}{2}$ -inch surface blow valve; one Salinometer cock.

Handling Bulk Freight on the Lakes

By J. D. Carey

IN THE first place, I want to give a vivid realization of what we are doing on the Great Lakes in handling bulk tonnage, in cutting loading and unloading time from weeks and days to hours and minutes. In the second place, I want to show the factors which, in my mind, have contributed to that wonderful success, and discuss these factors in detail. I might just at this time outline the three factors which I have in mind.

Firstly, the shipbuilders erected big ships, and then bigger ships, with the decks practically all hatches, with the hull clear and open, designed to handle bulk cargoes and handle them efficiently, quickly and at the least cost. Dovetailed in with this development is the building of dock equipment, which has kept pace with the rapid strides in shipbuilding. These developments, in turn, have necessitated the erection of larger and stronger docks.

Recalls Early Methods

In the early eighties I was sailing on the lakes. At that time three methods were used to unload ore: the first was with a horse on block and falls, which hoisted about one-half ton of ore in a bucket through the hatch to the height of the runways, where two men would drop it into a barrow and one would wheel it to the dock. The second method involved an engine with drum and three falls, arranged to hoist all at once from three different hatches. Next came the McMyler whirly which lifted a 1-ton bucket of ore from the ship to the car or dock.

I doubt if many realize the tremendous volume and importance of the commerce on the lakes today. It is estimated a boat passes through the St. Clair river on an average of every seven minutes from the opening to the close of navigation. As a further indication of the activity on the Great Lakes, let it be pointed out that the Pittsburgh Steamship Co. owns a line of 72 steam vessels and 21 barges, capable of carrying a total

of 687,000 gross tons in one trip. There are dozens of companies owning tremendous fleets on these lakes, such as M. A. Hanna & Co., Pickands, Mather & Co. and others too numerous to mention. Cleveland owns 45 lines.

To show the wonderful size of cargo carrying on the Great Lakes, it is interesting to take comparative figures for the Sault Ste. Marie and the Suez canals. Take, for instance, the year 1913, as this is the last normal year before the war. In 1913, 27,737,180 tons passed through the Suez canal. In the same year almost three times this amount, 75,173,822 tons, went through the Soo, and remember that the Soo is frozen over for almost five months each year. These figures are for cargo freight only, and do not include package freight, which is included to a great extent in the Suez canal figures. In July, 1917, a total of 20,504,000 tons of bulk cargo passed through the Soo, compared with 27,000,000 tons through the Suez canal in a year.

The first lake vessel to carry a cargo of bulk ore was the brig COLUMBIA. This vessel was 120 feet long and carried 200 tons, and may be compared with the modern freighter of today, such as the JAMES A. FARRELL, which is 560 feet long and carries 12,000 gross tons. If the COLUMBIA made a round trip every 14 days, which is quite impossible, she would be hauling for four years to carry what the FARRELL carries in less than eight days.

Improves Dock Equipment

As the boats increased in size and the volume of ore increased and the necessity of stock piles became imperative, Alexander Brown evolved the Brown hoist and bridge. At that time I was shoveling ore in Ashtabula harbor and our gang had the honor of putting out the first ship under his machine. We almost broke our backs trying to make a record, which we did, notwithstanding the fact that the cable parted on one machine, which my partner and I spliced. Having been sailors, we could make a long splice, otherwise he would have been stuck. Mr. Brown

camped out on the job all the time, and it was his innate courtesy that caused us to work so hard on the job. I remember he gave us \$5 apiece for that splice and our bloody hands proved that we earned it.

Dock equipment since has been developed to such an extent that at present a 12,000-ton boat can be filled in 45 minutes and a 10,000-ton boat in 26 minutes.

As the vessels became larger and as the ore bridges and the handling equipment increased in weight, it became necessary to develop docks that would not only withstand the terrific impact shock of a moving loaded ore boat, but further, a dock which would not be forced out into the water by the mountains of ore behind it; docks that would maintain rigidly static tracks in perfect alignment for the great unloading equipment.

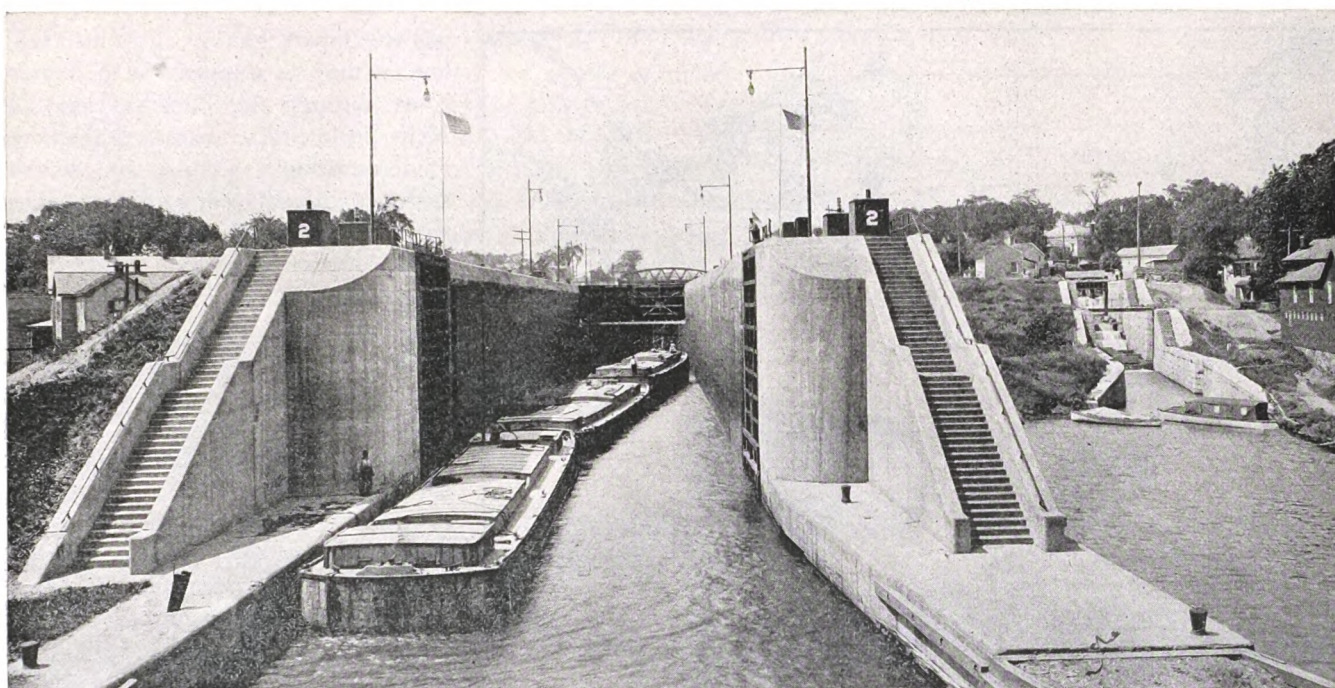
Huge Ore Piles of Today

Ore piles in this day and age are young mountains of 45 or 48 feet and over in height and 45 to 48 feet of iron ore is a weight of no small proportion. The furnace companies stock ore for seven months.

In 1906, W. S. Ferguson, who was then chief engineer of the Carey Construction Co., in designing and building a dock for the Cleveland Furnace Co., met and solved this particular problem by considering dock designing as a strictly engineering proposition and approaching it in a new way. He used reinforced concrete in a radically effective and original way, and a dock was built at that time which has stayed "put" ever since.

The future of America lies in world trade, and world trade means better shipping, and better shipping means more docks and piers, better ships, better ways of handling cargoes. What I have given is a brief picture of what we have done on the Great Lakes in the last 30 years. If we can do what we have done with bulk cargo, the same amount of combined thought and co-operative effort on the part of shipbuilders, machinery builders and dock builders can do a good deal more in handling cargoes of all kind in world trade.

Presented at the recent Cleveland meeting of the American Association of Port Authorities.



Comparison of the old and new canals at Waterford, N. Y.

New York's New Canal Ready in 1918

A Clear Waterway from Buffalo to New York Will be Open
for Traffic Next Year—Carry Lake Freight to Tidewater

By M. E. Mutchler



The author

canal, only for short stretches at Buffalo and Tonawanda.

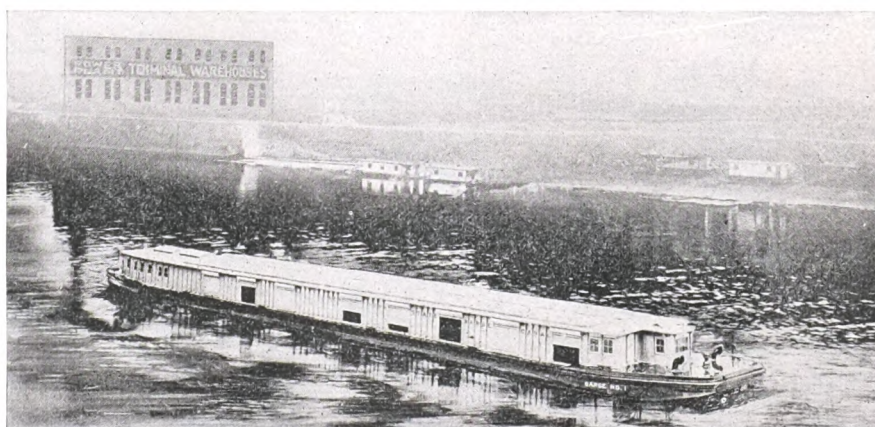
The season of 1918 will see this new canal system open for traffic, attracting freight from the furthestmost portion of the Great Lakes, the ore and coal mines of the middle west, the great lumber districts, and the vast granaries of the continent. It makes possible the transporting of these products from their origin to the Atlantic seaboard without breaking bulk at any port. It is probable, however, that some cargoes will be re-sorted and loaded at Buffalo, to

HE barge canals of New York state are not single or interrupted waterways. They embody a canal system. The work of construction is in charge of Frank M. Williams, New York state engineer and surveyor. The canal is now 95 per cent complete, being a clear waterway from Buffalo to New York, and being incomplete, as a barge

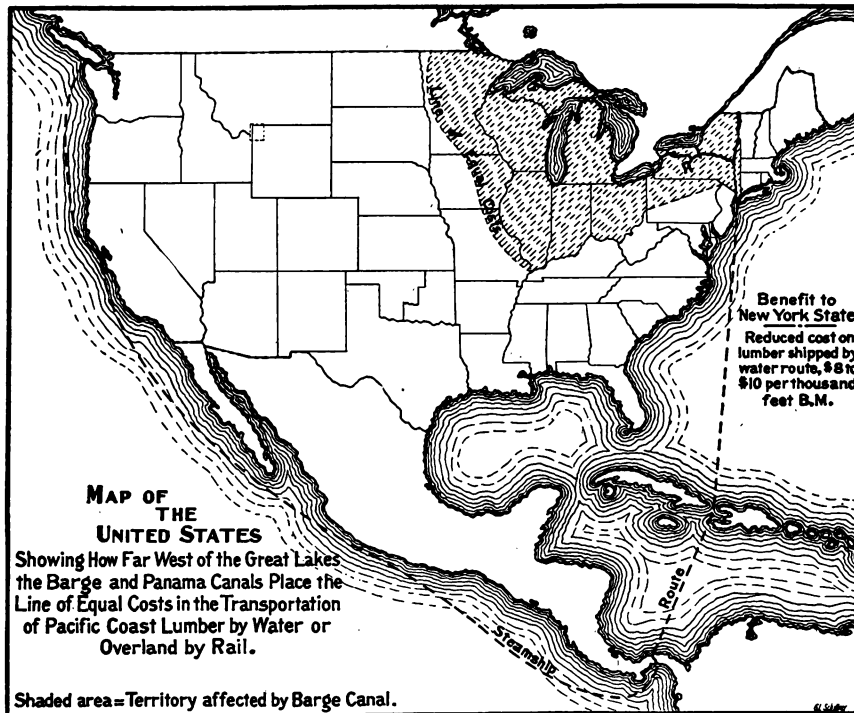
continue in 1000 and 2000-ton barges to the sea coast and possibly be redistributed there. So much for the handling of raw materials in bulk.

The State Barge canal passes through those portions of New York state destined to be the richest and most densely populated of the country. This canal traverses the busiest manufacturing towns; Syracuse, Rome, Utica, Rochester, the richest industrial centers, all of which practically owe their existence to the building of the original Erie canal. It takes in the numerous prosperous towns along the upper Hudson, and ends at modern new terminals in New York city.

While preliminary steps have been taken to develop



150 x 22-foot steel barge, eight of which are building by the American Bridge Co., for the Shippers Navigation Co., of Syracuse.



traffic, there still are such immense possibilities for capital and labor in the use of the waterways, that we deem it necessary to devote a few pages to the description of the New York State Barge canal, showing the suggested means of transportation and explaining what is being done.

BARGE CANAL DRAINS RICH REGION

Buffalo at the western terminus now has 790 miles of waterways available for the distribution of raw materials from the west. The entire region surrounding the Great Lakes is thus placed near tide-water and in communication, via the canal, with the richest and most densely populated state in the union. One should not imply from this that freight will be offered for eastern movement only. Even materials from the Pacific coast, so far as transportation cost is concerned, are now placed nearer the states border-

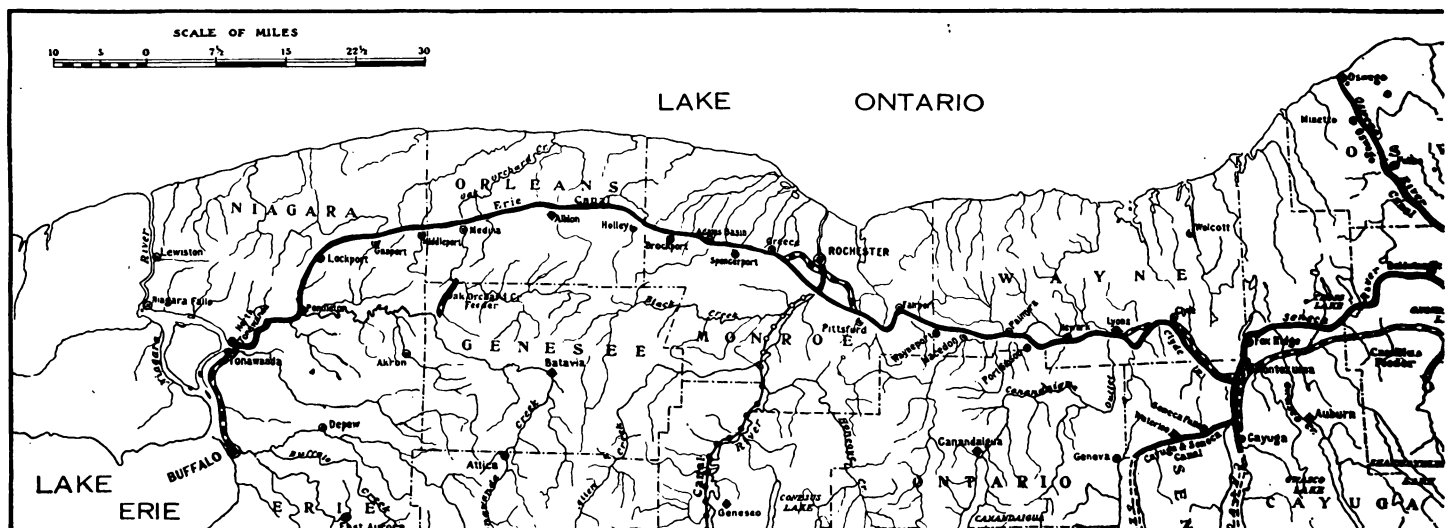
ing the Great Lakes. For instance, lumber may be shipped via the water route through the Panama canal to New York city, transferred there at modern terminals, under an efficient system of handling in packages rather than by piece, and reloaded to points west.

Buffalo and the Tonawanda districts are now the world's greatest lumber markets and this new possibility has a tendency to make them even greater, in addition to which it offers a ready supply of lumber products to the middle west, and its developing industrial centers. And the most important part of it is that the transportation cost will be lower than if sent overland via rail.

The exploiting of these territories is impossible without the use of power. The old system of mule-drawn vessels has been discontinued through act of the New York state legislature, and now only small tugs are used to draw barges of approximately 250 tons. But it is understood that the American Bridge Co., of Pittsburgh, has planned to build a fleet of 600-ton barges, 150 feet long, for the Shippers Navigation Co., of Syracuse, N. Y. These barges will be diesel powered. As evidence that the proposition is being duly considered, a well-known gas engine company of Buffalo is designing a diesel marine engine for this explicit purpose, a heavy-duty, continuous-operation machine.

HOW ONE COMPANY USES THE CANAL

The formation of a plan to exploit the commercial centers of the state has culminated in the incorporation of the Shippers Navigation Co., with headquarters at Syracuse, and offices and terminals at all of the principal cities, beginning at Buffalo, and ending at



New York and Brooklyn. This concern, formed by a number of shippers of Syracuse who are awake to the canal's possibilities, operates 42 vessels, at present steam-driven, and with a capacity of 200 to 250 tons, which handle miscellaneous cargo (an intermediate package service) and make even better time than railroad freight. As the business grows the present boats will undoubtedly be replaced by others. From a standpoint of economy and service, the craft should be driven by oil or gas engines.

The movement as begun by the Shippers Navigation Co. is one that should be encouraged by the use of the line for freight service. The plan should be followed by other cities, barges built and placed in operation.

No trouble is anticipated in securing shipbuilding materials for the construction of barges, as the United States shipping board, at Washington, has committed itself to the construction of vessels at Great Lakes plants, the board realizing to the utmost the value of every possible addition to the country's shippings.

With prodigious quantities of grain to be rushed to the seaboard for export to the allies, at the rate of 10,000,000 bushels a season, and with tremendous amounts of lumber and iron ore to be transferred to tidewater, boats of the type to be used on the barge canal demand movement by the internal combustion engine, preferably gasoline, kerosene and crude oil.

TIME COMPARES FAVORABLY WITH RAILROAD SERVICE

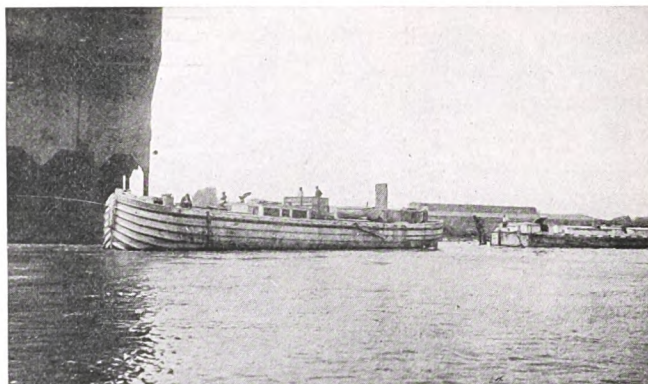
Traveling at a speed approximating six miles per hour on the cut portions of the canal, and increasing this speed where rivers and lakes have been adapted into the system, it is estimated that the trip from Buffalo to New York will take about 3½ days. By rail the time for freight is four or five days, and the cost of transportation via power canal barge will be less than half.

An important point to American interests is that this traffic will pass through New York state instead of being diverted at the foot of Lake Erie to Port

Colbourne, the Welland canal and the St. Lawrence river to Montreal. American capital will get the benefit of it.

BARGE CANAL IS A WATERWAY SYSTEM

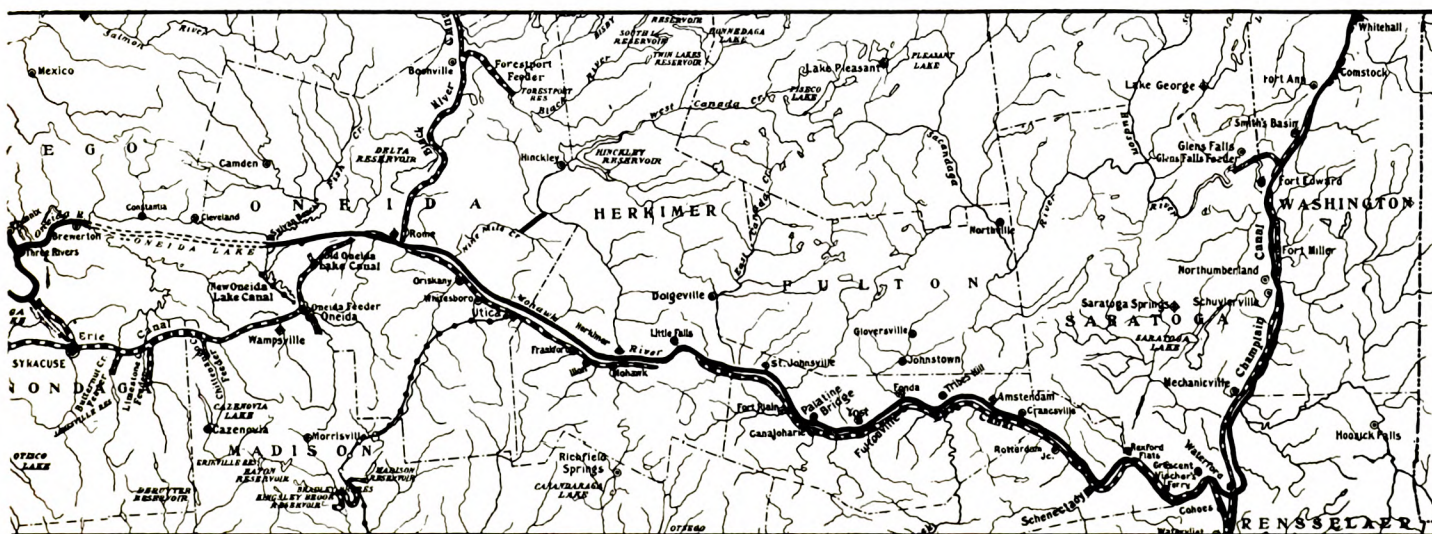
Most people have only a vague conception of what the New York State Barge canal is. It is not a narrow channel straight across the state. As a matter of fact it is a waterway system, including four canals, catering to four distinct and separate sections of the state. All four are joined and form the barge



A steam canal barge with tow at Buffalo

canal system, and all are of barge canal size, connected by modern locks and served with modern terminal facilities at nearly 50 points along the routes. The water depth throughout is never less than 12 feet and often greater.

Neither is it a widened and deepened Erie canal, but an almost entirely new work along new routes. The minimum width of the canal, where it runs through what was formerly land, is 75 feet at the bottom and 123 feet at top. Where the canal flows through channels blasted from rock, the width is greater, or about 94 feet. Where rivers and lakes have been canalized, the minimum width of the channel has been fixed by law at 200 feet, and at least 12 feet deep.



It was built by the people of New York, and is the connecting link between the great middle west and the seacoast.

Seventy-one per cent of the entire system is in canalized rivers or lakes. The importance of this lies in the fact that boats can proceed at the highest power of which their engines are capable through such canalized sections, instead of the usual 6 or 8 miles an hour.

The new canal is not an enlargement of the old canals. New routes have been followed and much of the original canal has been abandoned. At Rochester, for instance, the canal no longer passes through the city, but curves to the south and will be connected by a spur. As the canal traffic develops, Rochester will grow toward this route.

Another mistaken impression is that the barge canal is opposed by the railroads. Nothing could be further from the real situation. The railroads at the present time are short of cars—the department of commerce at Washington said, in June last, that the shortage was at least 100,000 cars. Yet, the full pressure has not fallen upon them. This is fully appreciated by the railroads.

As recently as June 20, 1917, the chairman of the executive committee of the American Railway association informed the chief of engineers, United States of America, that the railroads will welcome any practicable water transportation and are prepared to co-operate cordially with responsible persons or corporations who may provide such water transportation, by the exchange of traffic, the issuance of joint through bills of lading, and, if necessary, where conditions justify it, by joining the water carriers in the building of tracks to connect the railroads with the wharves and landings of water carriers.

As mentioned above, the barge canal system includes four canals. They are the Erie, which stretches across

the state 350 miles from Lake Erie at Buffalo to the Hudson river; the Champlain, extending northward from the eastern end of the Erie canal, at the Hudson river at Waterford, to the southern end of Lake Champlain, 61 miles distant; the Oswego canal, 23 miles long, flowing northward from Three Rivers at the confluence of the Seneca and Oneida rivers, which unite in the Oswego river. This canal connects with Lake Ontario. The Cayuga and Seneca canal

flows southward from the Erie, near Geneva, or to be exact at Montezuma, and extends south to Cayuga lake, and southwest to Seneca lake. A spur at the southern end of Cayuga lake makes Ithaca, N. Y., a canal port, while the spur at the southern end of Seneca lake extends to Montour Falls. The total length of the Cayuga and Seneca canal is 100 miles.

In addition to the 440 miles of construction there are 350 miles of intervening lakes or adjoining rivers, or a waterway system of barge canal size 790 miles in length.

Dredging the channels and canalizing lakes and rivers has been only a part of the immense engineering feat accomplished in the construction of the new barge canal system. Numerous locks, reservoirs, dams, and other structures,

many of them larger than those at Panama, had to be provided.

TERMINALS IN ALL CITIES

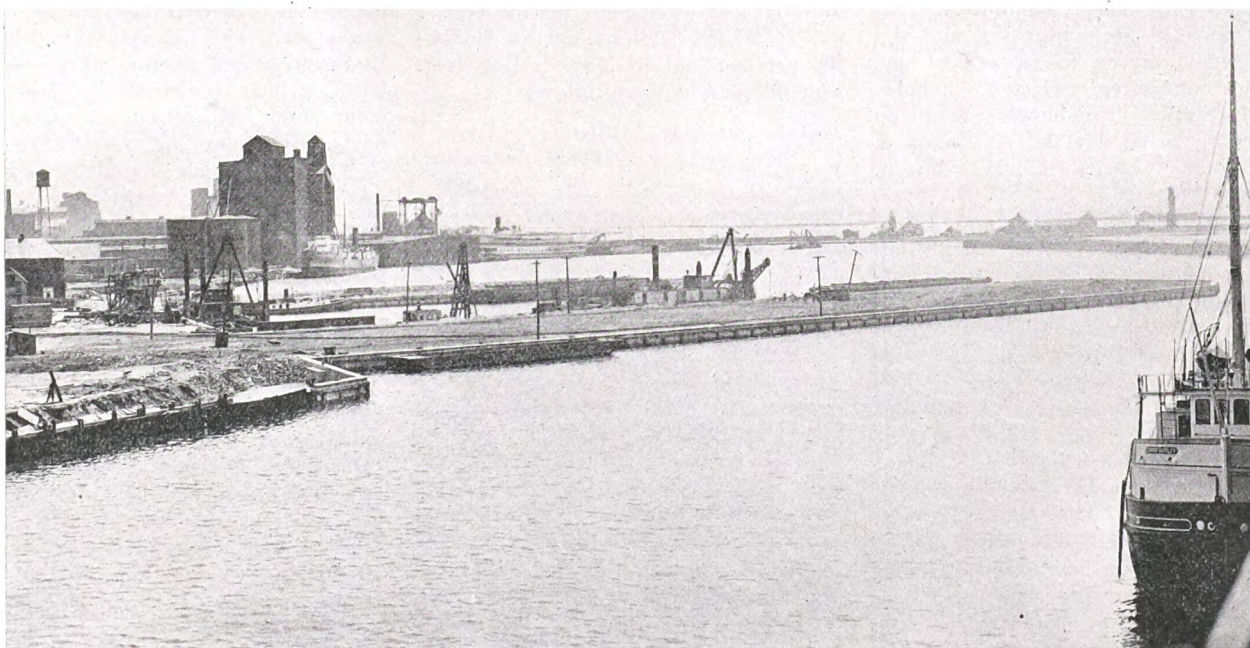
Next in importance to the canal itself will be the providing of adequate terminal facilities. Pleasing progress has been made this season in construction of the new terminals at the Buffalo end of the canal, and with their completion the work of constructing loading and unloading platforms of concrete with freight handling devices and transfer sheds will be practically



Power-driven barge, operated on the Regents canal, England, by Coggins & Arthur, of Birmingham, for carrying coal. This boat, with tow barge, has a capacity of 50 tons. Power plant is a 17-horsepower Sterling, mounted on top of the cabin



The completed terminal of the Barge Canal at Newark, N. Y.



The pier at Buffalo, practically complete, which will form the western terminal of the canal system

Comparison with the Panama Canal

New York Barge Canal.	Panama Canal.
540 MILES LONG.	50 MILES LONG.
TOTAL LOCKAGE LIFT, 1050 FEET.	TOTAL LOCKAGE LIFT, 170 FEET.
DAMS, 39.	DAMS, 4.
LOCKS—57 LIFT, 2 GUARD AND 9 SMALLER LOCKS.	LOCKS, 6 PAIRS.
NUMBER OF STRUCTURES—BETWEEN 350 AND 400.	NUMBER OF STRUCTURES—12
COST, \$127,800,000.	LOCKS, 1 SPILLWAY, AND 4 DAMS.
BUILT BY NEW YORK STATE WITH POPULATION OF 9,000,000.	COST, \$375,000,000.
EXCAVATION, ESTIMATED TOTAL 114,100,000 CUBIC YARDS.	BUILT BY UNITED STATES WITH POPULATION OF 90,000,000.
CONCRETE, ESTIMATED TOTAL 2,750,000 CUBIC YARDS.	EXCAVATION, ESTIMATED TOTAL 203,710,000 CUBIC YARDS.
WORK BEGUN APRIL 24, 1905.	CONCRETE, ESTIMATED TOTAL 5,000,000 CUBIC YARDS.
TO BE COMPLETED SPRING OF 1918.	WORK BEGUN BY AMERICANS MAY 5, 1904.
	COMPLETED 1914.

finished. Buffalo is to have two basins, one with water at a depth of 13 feet and the other 23 feet.

At the Erie basin are two piers, providing a convenient, ample and efficient transfer point of freight from lake vessels to canal barges. One of these piers is 600 feet long, the other 450, and each 150 in width. They are to be equipped with concrete warehouses, and electric freight-handling devices.

Eastward from Buffalo there are two terminal sites at the Tonawandas, and two at Lockport. At

both cities will be warehouses and derricks for prompt dispatch of freight.

Medina, Albion, Holley and Spencerport now have complete modern canal terminals, as well as Rochester. At the Flower City, the canal passes through South Park, crossing the Genesee river about 3 miles from the center of the city. In order to reach the business district, construction is to be pushed on a new dam across the river near which is the new terminal.

The Palmyra and Newark terminal dockwalls are built, and the side at Lyons is under contract. At this point the main or Erie canal joins the canalized Seneca and Cayuga lakes. The lakes of these names lying parallel to each other have been dredged through the centers so that it is possible for boats on leaving the restricted channel part of the Erie canal to speed through a deep channel in the broader lakes past their southern trips to Montour Falls on Seneca and Ithaca on Cayuga lake.

Another advantage of these and other canalized sections is that barges can pass each other—unlike when boats were towed by mules along a tow path. At Ithaca a commodious terminal harbor was built in 1914.

(Concluded in January)

Board Appointed to Direct Lake Trade

IN AN effort to handle the maximum tonnage of freight next season, a majority of the vessel owners of the Great Lakes have voluntarily approved a plan for placing the operation of their ships under the direction of a central committee. This plan has just been approved and the final details remain to be worked out.

The committee selected includes Harry Coulby, Pittsburgh Steamship Co.; John S. Ashley, M. A. Hanna & Co.; Capt. Charles L. Hutchinson, Pioneer Steamship Co.; C. D. Dyer, Shenango Steamship Co., and H. S. Wilkinson, Great Lakes Steamship Co. A number of additional committees will probably be appointed to handle the various details of the plan, all of these committees being under the guidance of the central board.

More than 85 per cent of the tonnage owned by the Lake Carriers' association already has been voluntarily placed under the direction of this committee. The plan has been tested in a small way this season, separate agencies having had general supervision over the iron ore, coal and grain trades. In view of the immense importance of employing the full lake fleet at its greatest efficiency next year, the plan was approved as the best method of eliminating delays and of properly balancing the respective needs of the various classes of

traffic. The commerce carried through the Soo canal last month showed a drop from 13,544,686 net tons in September to 12,646,066 net tons in October. This was a decline of 1,320,000 net tons from August. The total freight movement up to Nov. 1 was 76,099,252 net tons, against 80,374,509 net tons up to Nov. 1, last year. The detailed figures follow:

EASTBOUND		
	To Nov. 1, 1916	To Nov. 1, 1917
Flour, barrels	8,202,139	6,275,849
Wheat, bushels	175,180,717	129,482,350
Grain, bushels	68,179,438	53,258,698
Copper, net tons.....	101,515	97,795
Iron ore, net tons....	56,288,748	52,907,616
Pig iron, net tons....	12,050	8,224
Lumber, M. ft. B. M.	302,573	316,062
Gen. merch., net tons.	280,993	217,102
Passengers, number...	27,645	18,711

WESTBOUND		
Flour, barrels	13,321	90
Grain, bushels	6,695	5,885
Coal, hard, net tons..	1,888,831	2,178,248
Coal, soft, net tons...	12,487,895	13,355,383
Iron ore, net tons....	28,927	58,660
Mfctd. iron, net tons..	133,726	89,323
Salt, barrels	683,117	496,389
Gen'l merch., net tons	1,032,260	1,043,417
Passengers, number ..	24,283	18,665

SUMMARY		
Vessel passages, No..	22,098	19,533
Regis. tonnage, net...	61,097,204	55,500,798
Freight:		
Eastbound, net tons..	64,599,288	59,300,260
Westbound, net tons..	15,775,221	16,798,992
Total frght., net tons	80,374,509	76,099,252

Shipments of iron ore from upper lake ports dropped off sharply during October and the comparative decrease

in the ore movement, compared with 1916, is now the largest this year. During the last two months the lake fleet has moved 1,000,000 tons less than in the same period last year, while in June, July and August a gain of 920,000 tons over last year's record was made. The delays resulted largely from severe storms on the upper lakes, which hindered loading, and from some congestion at lower lake ports. Shipments by ports were:

Port	October, 1917	To Nov. 1, 1917
Escanaba	995,052	6,162,774
Marquette	461,284	2,870,100
Ashland	978,029	6,603,238
Superior	1,876,525	12,253,271
Duluth	2,497,629	17,686,997
Two Harbors	1,385,373	8,677,218
Total	8,193,892	54,253,598
1917 decrease	922,304	3,679,248

The receipts of iron ore at Lake Erie ports in October totaled 6,587,328 tons, against 6,864,645 tons in October, 1916. The balance of ore on dock on Nov. 1 was 8,823,170 tons, against 8,793,586 tons on Nov. 1, 1916. The detailed receipts by ports follow:

Port	Gross tons
Buffalo	1,290,179
Erie	293,257
Conneaut	1,070,077
Ashtabula	1,482,369
Fairport	340,611
Cleveland	1,084,480
Lorain	433,949
Huron	236,912
Toledo	329,536
Detroit	25,958
Total	6,587,328

Peace Must Bring Big Export Trade

Foreign Outlet Necessary to After-War Prosperity—Importance
of Merchant Marine in Approaching Struggle for World Trade

By Eugene P. Thomas

FOREIGN trade instead of being merely a contributing factor has become an indispensable element of our industrial prosperity. Henceforth, we must accustom ourselves to regard it as vitally necessary to our material well-being, no less than to our national safety. We have come slowly to realize the significance of what is called "militant commerce." We understand, as we never did before, the consequence that its prosecution entails. In their penetration of the markets of the world, German manufacturers and merchants had behind them a government whose ideals of national greatness were purely military. German commerce was the advance guard of German conquest, and the sacrifices made to forward the one were regarded as a legitimate contribution in the progress of the other.

It was largely due to the reaching out of Germany toward world dominion that there took place in the latter part of the nineteenth century an abnormal development of the German steel industry—a development involving capacities far in excess of the apparent demand. This excess was, in some years, equal to 40 per cent of the total production, and for the surplus thus created markets had to be found without regard to the immediate profit they might yield.

Industry Expanded Greatly

Stimulated by the demand created by the war, the productive capacity of this country has been enormously increased. The same thing has occurred, although not to so great an extent, in Great Britain, Canada and France, while new iron and steel industries have been created or expanded in other countries, as in Australia, India, China and Japan.

After the war we shall probably find ourselves with an annual capacity of 35,000,000 to 40,000,000 tons of finished steel, and if the domestic consumption is not greater than its maximum in the past, it will leave probably 8,000,000 to 12,000,000 tons to find export markets or from 30 to 100 per cent more than the present abnormal steel exports which are largely for war requirements.

England, with 8,000,000 tons in excess

before the war, will have 12,000,000 tons after it is over. The productive capacity of France and Germany must largely depend on the future of Lorraine and its ore deposits, as well as of the coal in the valley of the Sarre. In the event of the retrocession of both to France, her annual production of iron ore would be raised to 43,000,000 tons, while that of Germany would be

Big Railroad Era Near

"It should be safe to predict that the 10 years succeeding the conclusion of peace will be such an era of railroad construction as the world has not seen. And, where the railroads go, into lands old and new, there will be created a demand for the utmost volume of manufactures in the service of improved agriculture, of mining, of the utilization of waterpower and of the process of an expanded and diversified industry. No 'glut' of steel should be apprehended because what we call the process of reconstruction will simply be the beginning of an unexampled development of the productive energy of the newly enfranchised nations."—Eugene P. Thomas.

reduced to 8,000,000. In addition, France would have a new annual production of 16,000,000 tons of coal.

Whatever the distribution of the European ore supply, it may be confidently asserted that our capacity after the war will represent nearly, if not quite, as much as that of all other steel producing countries combined. We shall thus be as urgently in need of foreign markets for our products as the Germans ever were. But there would seem to be no reason to apprehend the postbellum "glut" of steel which some pessimistic observers have prophesied, at least during the first few years after the advent of peace. The destruction which has followed in the track of war has been so thorough and widespread, the depletion of existing stocks so complete, and the suspension of antecedent enterprises so much the rule, as to preclude any doubt about the steelmaking capacities of the world, during the period of rehabilitation, being fully employed. In addition,

the regeneration of the shipbuilding industry in this country will continue to provide a tremendous outlet for steel, and the coming demand for structural shapes may be partially gaged from the fact that building statistics show that new construction has been greatly curtailed, as a result of the war requirements. The same statement applies to Europe as a whole no less than to the more progressive sections of other continents, and there can be little question that after the war the demand for steel will be sufficient to keep the industry on a stable basis for a considerable period.

Must Organize for Common Purpose

But it should be recognized that our share of this process will be small or great in proportion as we are able to co-ordinate our vast and varied productiveness to a common end. The necessity of balancing imports and stabilizing exchange; the creation of an American merchant marine, the necessity of compensating the output of additional capacity by increase of exports, and the advisability of meeting the combination of our competitors in foreign markets by the use of similar weapons, would seem to be among the rudimentary requirements of the situation.

All of the European countries now at war will be under the most urgent necessity of exporting their products to the greatest possible extent as a means of rehabilitating exchange and of applying for needed imports. We may expect, as a consequence of the experience gained during the war, that the manufacturing nations of Europe will have learned the absolute necessity of organization, co-ordination and co-operation. If we are to meet them in foreign markets on terms of equality, it will be necessary not only that we establish methods of mutual co-operation, but that our government aid and protect us at least as effectively as our competitors will be aided and protected by their respective governments.

Our country has had to pay dearly for our abject submission to the decay of our merchant shipping in foreign trade. But the lesson has been learned and with it has come a recognition of these fundamental principles; we must

(Concluded on page 456.)

Presented at the recent meeting of the American Iron and Steel Institute at Cincinnati. The author, Eugene P. Thomas, is president of the United States Steel Products Co., New York.

Latest Marine News in Pictures

Payment Will Be Made For Acceptable Photographs

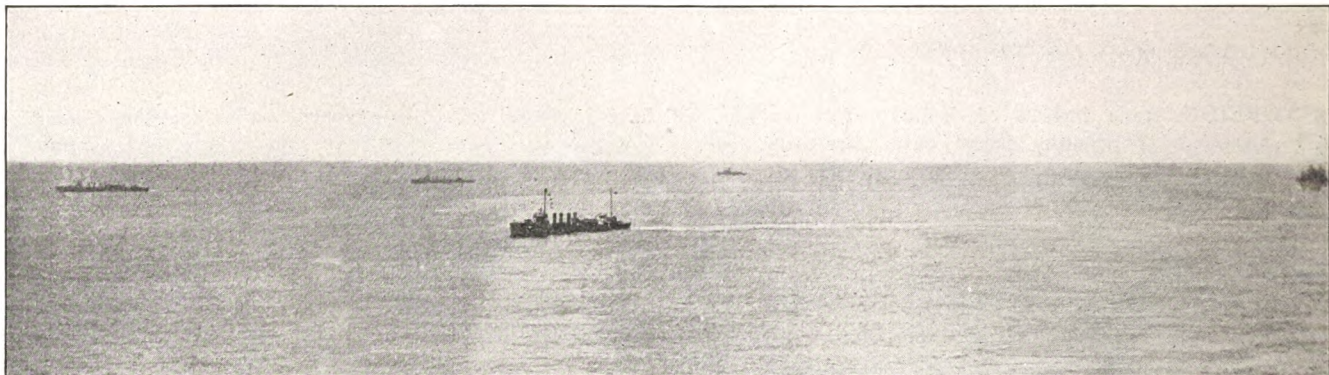
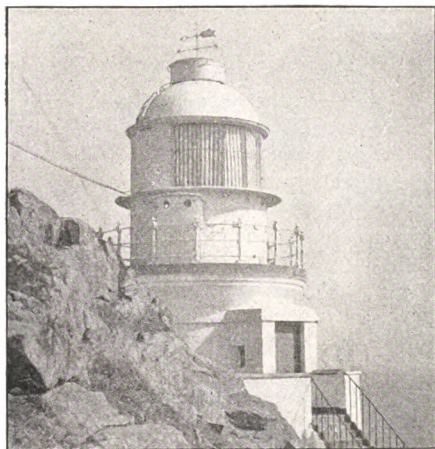


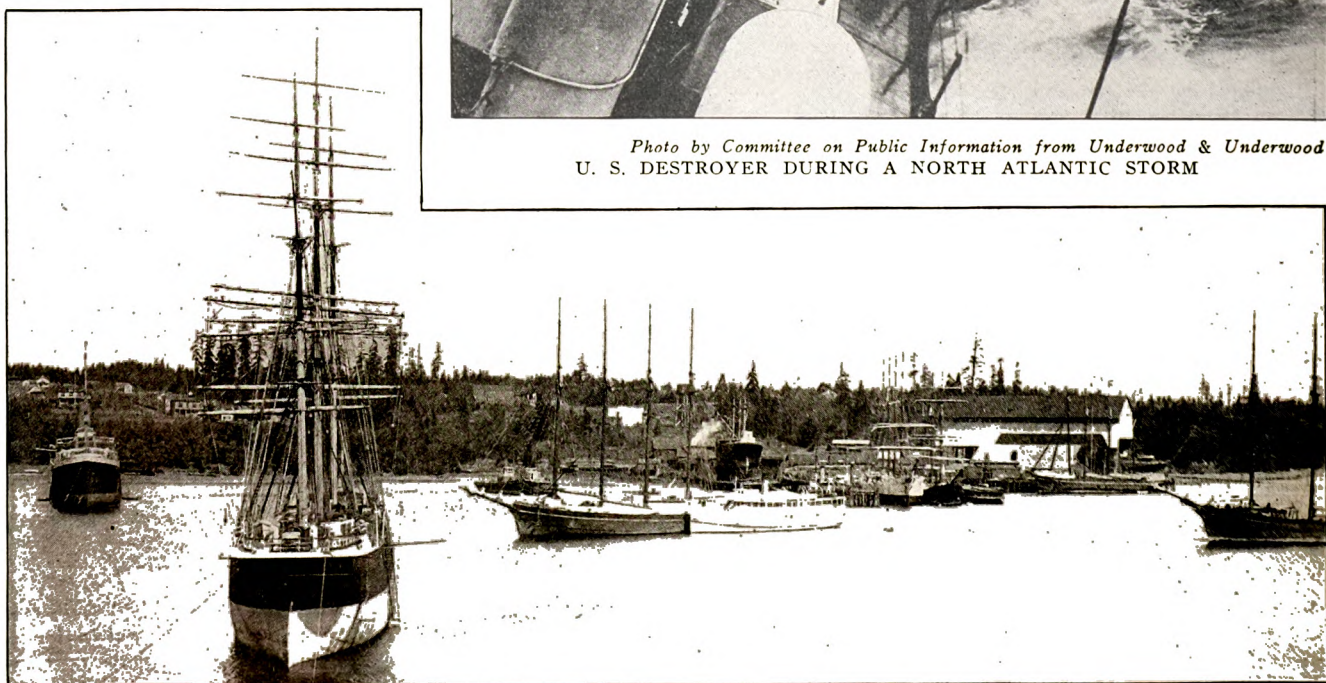
Photo by Committee on Public Information from Underwood & Underwood.
A SCENE WHICH FAILS TO AROUSE ENTHUSIASM IN A U-BOAT CAPTAIN. GROUP OF AMERICAN DESTROYERS IN
BRITISH WATERS



MODERN CHINESE LIGHTHOUSE



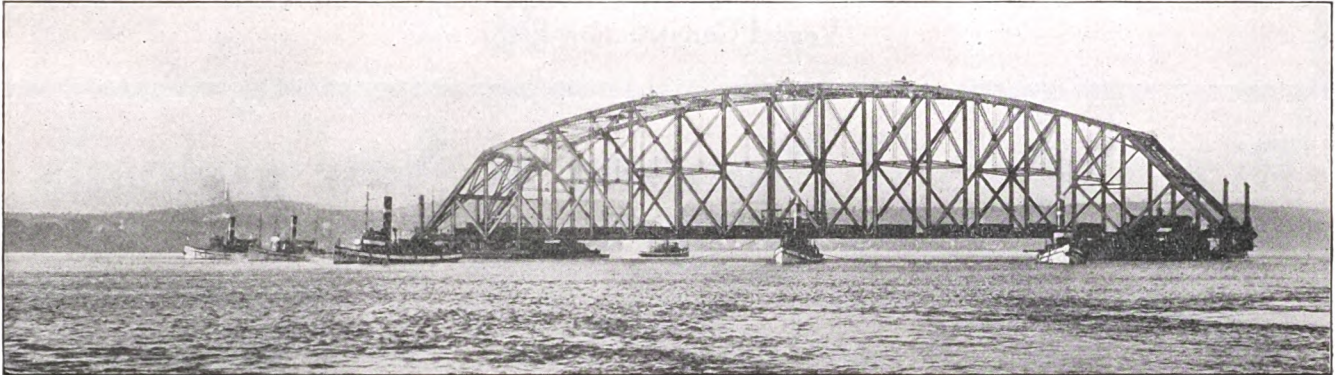
Photo by Committee on Public Information from Underwood & Underwood.
U. S. DESTROYER DURING A NORTH ATLANTIC STORM



ANSWERING THE CALL FOR SHIPS AT A PACIFIC COAST YARD

Photographs From Far and Near

Contributions For These Pages Are Solicited



BIG CENTRAL SPAN OF NEW QUEBEC BRIDGE BEING FLOATED UP THE ST. LAWRENCE. THE SPAN WAS LIFTED INTO POSITION IN A FEW HOURS AND CARRIED ITS FIRST TRAIN OCT. 17

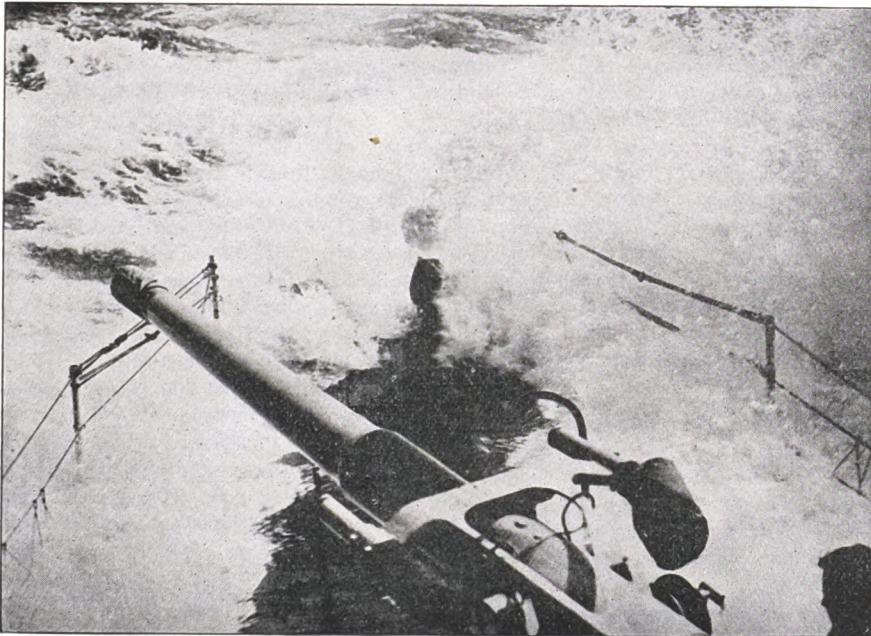
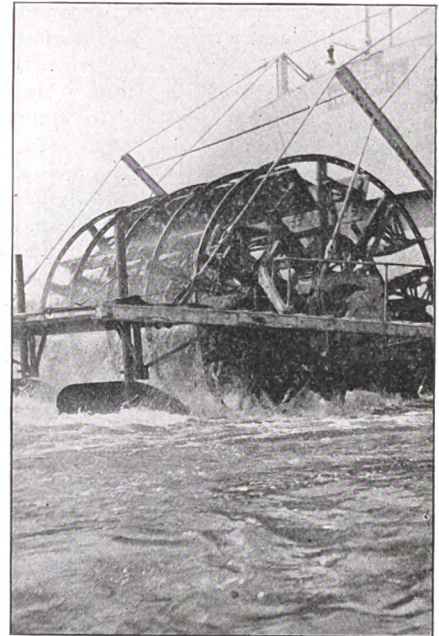
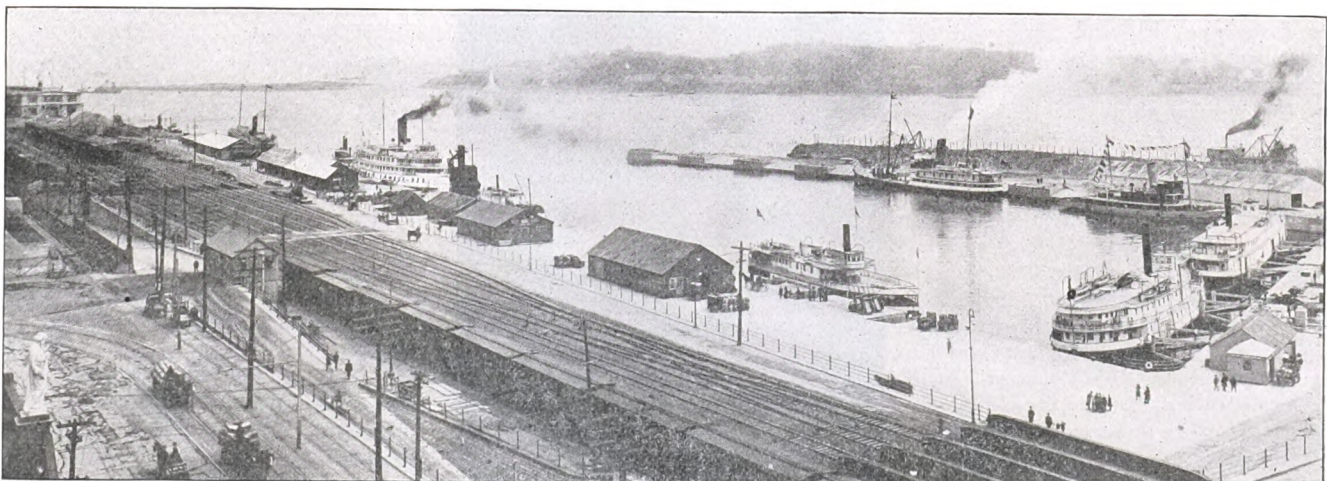


Photo by Committee on Public Information from Underwood & Underwood
DESTROYER SPEEDING THROUGH A ROUGH SEA



STERN PADDLE WHEEL ON MISSISSIPPI RIVER DREDGE



MONTREAL HARBOR WHERE RIVER, LAKE AND OCEAN VESSELS MEET

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American Ship Yard Activities

A Snappy Summary of the Leading Events of the Month in the
Vessel Construction Field

Big Shipyard Planned at New Orleans

TWELVE steel ships, to cost \$10,000,000, are to be built in New Orleans, according to Ernest Lee Jahncke, president of the Jahncke Shipbuilding Co., the Jahncke Navigation Co., and the Jahncke Sand & Gravel Co., who returned from Washington with the contracts for these ships, early in November.

The vessels are to be constructed for the Emergency Fleet corporation in a new shipyard at New Orleans, presumably on the river front. Mr. Jahncke refuses, at present, to state the exact location of the new yard. The Jahncke Navigation Co. has a shipbuilding plant at Madisonville, about 30 miles north of New Orleans, on the opposite shore of Lake Pontchartrain, and while this yard is building several wooden freight carriers of about 2000-ton capacity, all are of less than 15 feet draft.

If the new steel ships, which, Mr. Jahncke announces, are to be of 5000-ton capacity, are built at Madisonville, however, a channel at least 30 feet deep, will have to be dredged for practically the entire length of the lake, approximately 30 miles, to give access to Mississippi sound. Dredging of this, though the bottom is soft, would require nearly a year, and cost approximately \$1,000,000.

While the prime purpose of the new yard will be to construct these steel ships, the contracts were let on the assurance that the yard will be kept open afterward, not only for the construction of other similar ships, but for regular shipbuilding for commercial purposes, both during and after the war. In other words, New Orleans feels that it is to have the largest shipbuilding plant in the south, to be established immediately, and to be kept open permanently.

The plant, according to Mr. Jahncke, will employ approximately 1000 men. The 12 big vessels are to be completed in New Orleans, even to the mounting of their guns. These vessels, it is understood, will be driven by oil engines. Contract for fabricating the steel, has been let to the Virginia Bridge & Iron Co., Roanoke, Va. This supply of steel

will be supplemented by other shipments, it is reported, from the Birmingham, Ala., district. The wood used will be Louisiana pine, oak and cypress.

New Mobile Firm

W. L. Kelly and Mac R. Fife of the Kelly-Atkinson Construction Co., 189 West Madison street, Chicago, have incorporated the Mobile Shipbuilding Co., with general offices and works at Mobile, Ala. The Kelly-Atkinson Construction Co. has assigned its contract with the United States Shipping Board Emergency Fleet Corp. to the Mobile Shipbuilding Co. This contract calls for the construction of 18 single-screw, composite cargo-carrying steamers. The Kelly-Atkinson Construction Co. will retain its general offices at Chicago.

M. M. Davis & Son, Solomons, Md., shipbuilders, and Moses. Pope & Trainer, New York City, engineers, have incorporated under the name of M. M. Davis & Son, Inc. The shipyard at Solomons will be enlarged to enable

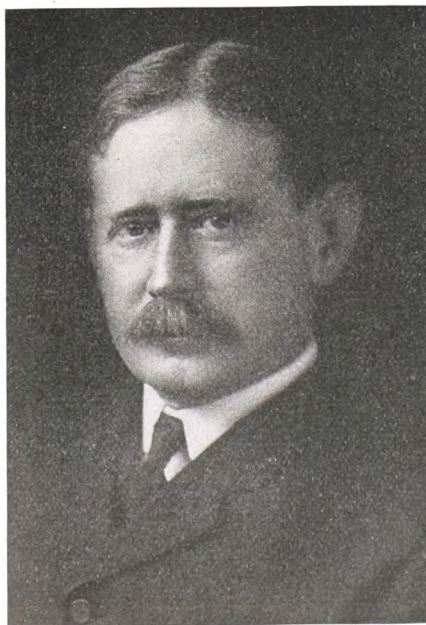
the company to accept new work. It is now building barges and tow boats for the Bethlehem Steel Co. and the Northern Transportation Co., Baltimore. The officers of the company are M. M. Davis, president; Clarence E. Davis, vice president and manager, and J. N. Trainer Jr., secretary and treasurer. A New York office has been opened at 366 Fifth avenue.

John R. Russell Heads Lake Shipyard

John R. Russell has been elected president of the Great Lakes Engineering Works, Detroit. This announcement was made after the recent annual meeting of the directors of the company. The promotion was well earned as for many years Mr. Russell has been a leading factor in the development of the shipbuilding industry of the Great Lakes. He was chiefly instrumental in the organization of the Great Lakes Engineering Works 16 years ago, and it has been due in no small measure to his untiring efforts that the company has been able to attain its present day success. Starting with the purchase of the engine works of S. F. Hodge & Co., Detroit, the company has grown until it now owns two large shipyards at Ecorse, Mich., and Ashtabula, O., which according to an announcement at the meeting, will turn out next year one ocean-going vessel every other week. A. C. Pesano, former president of the company, will act as chairman of the board of directors with headquarters at New York.

Movie of Wooden Ship Under Construction

The South's part in carrying out the government's plans for building a great fleet of wooden ships is to be emphasized in a comprehensive film which will be shown at 3000 theaters throughout the country. It is pointed out that 250 hulls are now under construction at 40 shipyards along the Atlantic and Gulf coasts, forming an important unit of the government's big wooden-ship program. These yards, it is said, are now em-



JOHN R. RUSSELL

ploying slightly more than 35,000 men.

The Southern Pine association, which has taken aggressive action in promoting the success of the government's plans, was responsible for the making of this film. The series is unusually complete and follows carefully each detail of the construction of a wooden ship from the time the trees are felled until the boat enters the water. The final scene shows the launching of the largest wooden passenger and freight carrier ever built in the South. This boat is the steamer MAPLE, which was described and illustrated in the November issue of THE MARINE REVIEW.

Pacific Wooden-Ship Builders to Organize

Plans of wooden-ship builders of the Pacific coast to organize an association to aid the government in carrying out its shipbuilding program gradually are getting under way. The project has been under consideration for some time and a number of the leading builders have now got together and plan to form the association at once. It will be the plan of the organization, which is to be known as the Pacific Wood Ship-builders' association, to gather all data in connection with the shipbuilding industry and place it before government officials. It also will be a function of the association to spread a propaganda of an educational character throughout the country so as to make clear the importance and value of the work being done on the Pacific in building wooden ships. W. D. B. Dodson, secretary of the Portland, Oreg., chamber of commerce, is in active charge of the work of organization.

Engineers Called to Help Shipping Board

Charles A. Piez, of the Link-Belt Co., Chicago, has been made vice president of the Emergency Fleet corporation. He will have charge of the actual construction of the vessels and will be called upon to speed up the delivery of materials. James Heyworth, Chicago, a contractor, will assist the corporation in building wooden ships. Together with A. J. Mason, a Chicago engineer; Charles Day of Philadelphia, and Frank Kirby, naval architect; these men have been studying the problems ahead of the government in carrying out its immense shipbuilding plans. Their appointment to official positions with the Emergency Fleet corporation is an indication of the intention of the shipbuilding board to employ every effort to build 6,000,000 tons deadweight by Dec. 31, 1918.

Approves Steel Standards

Emergency Fleet Corporation Adopts Recommendations for Structural Steel for Ships

RECOMMENDATIONS made by American steelmakers for standardizing the manufacture of structural steel for ships have been adopted by the Emergency Fleet corporation. The standard practice recommended is designed to reduce the number of sizes of sections and the number of different thicknesses of plates. Mills making structural sections for one ship will be enabled to roll sections for another, thereby obtaining maximum

provided, however, that ship channels and bulb angles may be rolled if required by shipbuilders' schedules.

That sketch plates be ordered in multiple and cut to size at the shipyard, rolling mills to furnish to sketch only straight double or single taper plates.

That within universal plate mill limits, plates be furnished sheared or universal at mills' option. Where sheared plates are absolutely necessary, orders should be marked "sheared only."

Plates, shapes and bars 3 feet long and shorter should be ordered in multiple lengths. To assist mills, orders should specify lengths into which multiples are to be cut so as to permit, at mills' option, application of short length pieces.

Plates narrower than 18 inches (preferably 24 inches) and lighter than $\frac{1}{4}$ inch should be ordered in multiple widths, to be recut to widths at the shipyards, and to assist mills, orders should specify widths into which multiples are to be cut so as to permit, at mills' option, application of narrow width plates.

That extreme sizes of plates, as shown in makers' published lists, both as to widths and lengths, should be avoided, as the rolling of such extreme sizes reduces the output of the mills.

That the steel be manufactured in accordance with American Bureau of Shipping requirements, Lloyd's Register of Shipping or Bureau Veritas as may be called for by shipbuilders' schedules, these classification societies accepting standard specifications for structural steel for ships of the American Society for Testing Materials.

A list of the standard size of angles and thicknesses of plates is included in the recommendations.

Losses Sustained by British Shipping

Week ended:	Ships over 1600 tons	Under 1600 tons	Total
Mar. 4.....	14	9	23
Mar. 11.....	13	4	17
Mar. 18.....	16	8	24
Mar. 25.....	18	7	25
Apr. 1.....	18	13	31
Apr. 8.....	17	2	19
Apr. 15.....	19	9	28
Apr. 22.....	40	15	55
Apr. 29.....	38	13	51
May 6.....	24	22	46
May 13.....	18	5	23
May 20.....	18	9	27
May 27.....	18	1	19
June 3.....	15	3	18
June 10.....	22	10	32
June 17.....	27	5	32
June 24.....	21	7	28
July 1.....	15	5	20
July 8.....	14	3	17
July 15.....	14	4	18
July 22.....	21	3	24
July 29.....	18	3	21
Aug. 5.....	21	2	23
Aug. 12.....	14	2	16
Aug. 19.....	15	3	18
Aug. 26.....	18	5	23
Sep. 2.....	20	3	23
Sep. 9.....	12	6	18
Sep. 16.....	8	20	28
Sep. 23.....	13	2	15
Sep. 30.....	11	2	13
Oct. 7.....	14	2	16
Oct. 14.....	12	6	18
Oct. 21.....	17	8	25
Oct. 28.....	14	4	18
Nov. 4.....	8	4	12
Total	635	229	864

production. The recommendations for a standard practice, as printed in a pamphlet issued by the Carnegie Steel Co., include the following:

That shipbuilding practice conform to uses established as standard in the fabrication of shapes and plates for bridges, buildings and cars, and that useless and minute variations be absolutely eliminated.

That to relieve the present mill congestion the use of tees and deck beams be eliminated to the greatest extent possible.

That thicknesses of plates be specified in multiples of $\frac{1}{16}$ inch ($\frac{1}{32}$ inch where necessary).

That structural channels or angles be used for ship channels or bulb angles;

Big Demand for Shipyard Equipment

Rapid expansion of shipbuilding along the Atlantic coast has resulted in heavy demands for shipbuilding equipment. The machine tool industry for months has been unable fully to care for the demands of shops making war munitions and the new demand from the shipyards found the machine tool builders unable to supply equipment as rapidly as needed. The imperative necessity for building ships, however, has lead the government to give priority to shipyards orders' and the construction of new plants and the expansion of

older plants will be carried out rapidly.

Large purchases of shipbuilding machinery are being made for the United States government plant under construction at Buffalo for the manufacture of steam turbines for the fleet of destroyers to be constructed for the navy department. Officers of the Fore River Shipbuilding Corp., Quincy, Mass., now a part of the Bethlehem Shipbuilding Corp., will operate the plant. The initial building will be 300 x 700 feet. The estimated cost of the complete equipment is \$1,000,000. The plant is expected to be operating in about three months and will employ 2000 men.

Among other heavy buyers are the New York Shipbuilding Corp., which will build 20 destroyers at its Camden, N. J., plant; the William Cramp & Sons Ship & Engine Building Co., Philadelphia, and the Newport News Shipbuilding & Dry Dock Co., Newport News, Va. The latter company contemplates the construction of additions to its marine ways, foundry, machine shop and other buildings. The Federal Shipbuilding Co., 54 Dey street, New York, has recently issued several large lists of cranes and tools required for the plant being erected on the Hackensack meadows. The Submarine Boat Corp. and the Lackawanna Bridge Co. are now purchasing equipment for the extensive plant building near Newark, N. J. The plant includes an administration building, hotel and restaurant, two fabricating shops, a terminal building, a hospital, two garages, a machine shop, a main substation and meter house, a transformer station, an engine house and other buildings. Several cranes have been purchased by the Eastern Shore Shipbuilding Corp., 2 Rector street, New York, for its new shipbuilding plant near Baltimore.

The American International Shipbuilding Corp., 142 North Broad street, Philadelphia, is rapidly completing its ship assembling plant at Hog island. The company plans to let contracts for about 95 per cent of the fabricated steel used in the ships and to fabricate the remaining 5 per cent at its plant.

The J. H. Mendel Engineering & Construction Co., Manchester, N. H., will establish a shipbuilding plant at Newington, near Portsmouth, N. H., for the construction of wooden vessels of the Ferris type. Approximately \$400,000 will be expended on the plant, which will employ about 2000 men.

The Elizabeth City Ship Yard Co., Elizabeth, N. C., was recently incorporated to take over the marine railways at that city. The company expects to build boats, barges and tugs up to 200 feet in length. The marine railways also can handle boats up to 200 feet.

His Record Proved by Discharge Book

The assistance his discharge book gave to a lake sailor is outlined in a recent issue of *The Bulletin* of the Lake Carriers' association. The article follows:

To what good purpose the discharge book can lend itself was well exemplified in a case last month. It seems that one of the students in the marine engineering school last winter was born in Germany. The U. S. inspector passed him as first assistant engineer, 9000 tons. He was to be granted his naturalization papers just about the time he took his examination, but it happened that through an error upon somebody's part, there had been a failure to verify the young man's date of arrival at the port of New York; that is to say, his date of arrival, as upon file with the immigration bureau, must correspond with his statement. That seemed simple work, but before it was accomplished black war clouds appeared upon the horizon and the state department sent out the order not to naturalize any more German-born until the conclusion of the war.

Without naturalization papers the young man could have no engineer's license, so he was in a predicament all summer. But he didn't sulk in his tent. He took the matter philosophically by saying "that's the law and I will stand by it." Some men would have become sullen, would have retaliated, perhaps, by doing something mean. But this chap had become an American in his heart. He went to work on the boats—firing or oiling, as he had the chance. Along about July the attention of United States Senator Pomerene was called to the matter and he, in turn, took it up with the state department. There it was decided that the case possessed elements that might warrant an exception being made if the case were brought before a United States court.

In the belief that court proceedings would cost a considerable sum, at least \$150, the young man's acquired Americanism rebelled at the suggestion, for he said with some spirit: "I don't want to buy my citizenship; I want it honestly, just like anybody else gets it." When told, however, that the fees would be nominal he went ahead. He was on hand when his case came up for hearing in a United States court a few days ago. After testimony had been presented to show that naturalization papers had been held up through a technicality, the learned judge interrupted the proceedings by saying: "We will lay all that aside. I find here that the applicant has served on an American vessel for three consecutive years, which fact will entitle

him to citizenship, and unless that evidence can be refuted, application in this case is granted." Well, the records in the discharge book were irrefutable and the young man got his naturalization, and his engineer's license, too.

And so the discharge book answered another good purpose.

Book Review

Handbook of Ship Calculations, Construction and Operation, by Charles H. Hughes; leather; 740 pages, 4½ x 7 inches; published by D. Appleton & Co., and furnished by THE MARINE REVIEW for \$6 net.

How to build ships faster than the German submarines can torpedo them is one of the most vital problems of the day. To accomplish this it is necessary that our shipbuilding facilities be greatly increased. This, in turn, will introduce into the shipbuilding game a host of men who know little or nothing about the industry. If they are going to be successful they must learn their business, and this they can achieve in two ways, by actual practical observation and by means of books.

"Handbook of Ship Calculations, Construction and Operation" is written with the object of supplying practical information to men engaged in the designing, building and operating of ships. Section I, comprising 69 pages, is devoted to weights, measures and formulas which would be of use to shipbuilders. Section II contains data on the strength of materials, Section III discusses the various shipbuilding materials, steel and iron, non-ferrous metals and alloys, wood and miscellaneous nonmetallic materials. The section on wood as a material for shipbuilding is inaccurate and incomplete. In the main, however, the book contains valuable information.

The book contains 10 sections in all, the remaining ones being devoted to the following subjects: Ship calculations; hull construction; machinery; electricity; heating, ventilation, refrigeration, drainage, plumbing and fire extinguishing systems; ship equipment, and ship operating.

Seeks Owner of Deep Water Gage

Shipowners on the Great Lakes will be interested in the following letter received by THE MARINE REVIEW: "We have found a deep water gage in Lake Superior, off Caribou island. Inside of the gage is a silver apparatus. The patent number is 275,199 No. A. 784. We are anxious to return it to the owner." Further information can be obtained by communicating with THE MARINE REVIEW.

How Wooden Ships Are Built--VII

Stern Framing Presents Many Problems—Transom, Fantail, and Elliptical Sterns Described—Details of Methods of Stern Construction

By H. Cole Estep

STERN framing involves many problems, not only on account of the large number of pieces necessary to build up the stern of a wooden vessel, but also because of the number of different types of sterns in use. In fact, it is the stern which gives character to the entire vessel and here we find the most distinctive lines. This has been true of naval architecture in every age. The old Spanish galleons were not specially different in many of their elements from modern wooden ships. They are famous, however, for their exceedingly bizarre, high awkward sterns. The same remarks apply to the Chinese luggers that infest the Yellow sea.

In fact, just as different periods have produced their particular forms of land architecture, so there has been a succession of styles in naval architecture, each of which has grown out of that preceding it. And, as in the case of land architecture, the latest style is preferred for a period as being more beautiful and useful; it gives way, however, in time to other styles which are considered superior to it. In no part of a wooden ship have these differences in style been more marked than at the stern and the problems of construction have been

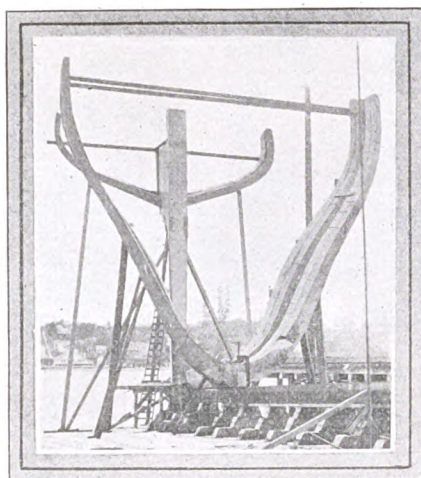


FIG. 100—DETAIL OF STERN FRAME OF SHIP BEING BUILT FOR UNITED STATES GOVERNMENT

similarly influenced. Today, therefore, we have several different types of sterns in service. Most American wooden ship builders prefer the square or transom stern. This stern may be made either with or without quarter blocks. A good example of the former type is shown in Fig. 124. A transom stern of the latter type, framed without the use of quarter blocks, is shown in Fig. 101.

For steamers and full-powered mo-

tor ships many builders prefer the fantail or elliptical stern. Examples of this stern are shown in Figs. 105, 119 and 125. In fact, this type of stern is so popular with steam ship builders that it might be called the steamer type of stern, just as the straight stem forms the steamer-type bow. We also have conical sterns, which when properly designed are unusually graceful, as well as the parabolic or cruiser-type stern. Practically no wooden ships have been built with sterns of the latter two types.

In all sterns, the combination of frames is uniform as far aft as the sternpost. Up to this point, the framing is nothing more than a cant arrangement. In both the elliptical and transom sterns, the last of these cants is termed a fashion timber. It is so disposed that the various elements of the stern framing proper can heel against it. The fashion timber of a transom stern is shown very clearly in Fig. 107. This illustration, together with Figs. 108, 109 and 110, shows the details of one method of framing a transom stern.

The transom stern is sufficiently important to justify a detailed description of one method of timbering

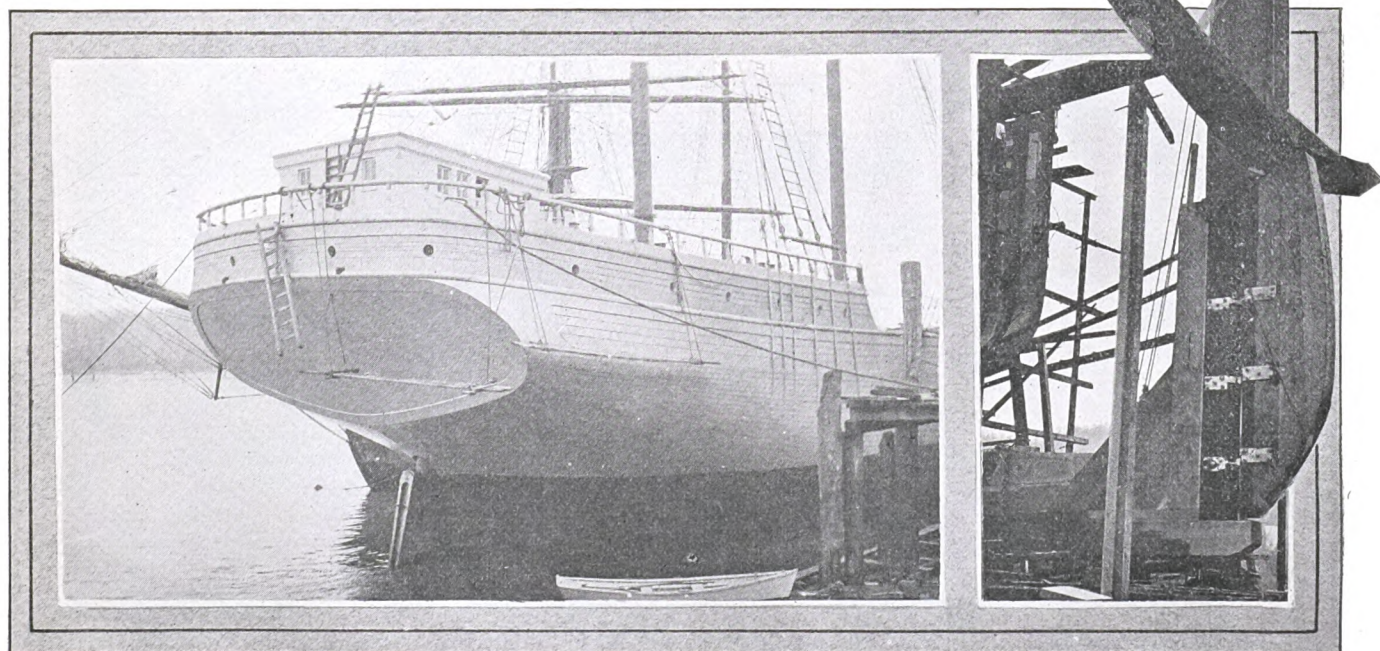


FIG. 101—FINISHED TRANSOM STERN ON A 5-MASTED MOTOR SCHOONER. FIG. 102—DETAIL OF RUDDER AND RUDDERPOST ASSEMBLY

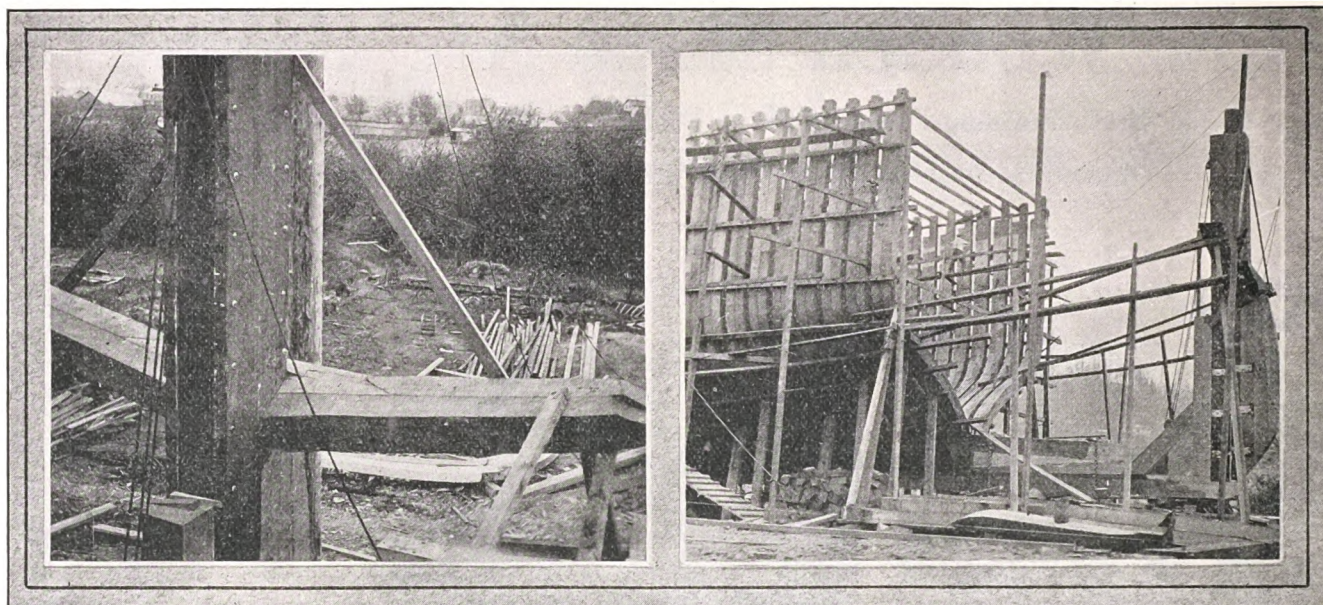


FIG. 103—DETAIL OF UPPER PART OF STERN FRAMING SHOWN IN FIG. 102. FIG. 104—GENERAL VIEW OF STERN FRAMES AND RUDDER ASSEMBLY

it. As previously stated, this type of stern is sometimes called the square stern. Aft of the fashion timber it may be composed of two sets of timbers as follows:

- 1.—Horizontal timbers, extending from fashion timber to fashion timber and scoring into the stern post. These are termed transoms.
- 2.—Vertical timbers, extending from the upper transom to the rail. These pieces, which are termed stern timbers, are shown in Fig. 108.

The farthest of these stern timbers from the middle line, the one which partakes of the rake of the stern and

also of that of the topside, is termed the side-counter timber. It is shown in Fig. 107. It heels against the upper transom and fays against the fashion timbers.

In some ships, the transom timbers situated at certain positions are distinguished by particular names. The one which forms the base of the stern, that is the transom upon which the stern timbers step and to which they may be tenoned, is termed the wing transom. Boxen wooden is left on the edge of this timber in order

to house the planks of the bottom and to receive the fastenings of their hooding ends. The line at which the planks end is called the margin; and a rail called the tuck rail is fitted over the boxen left above the margin, thus giving a finished appearance at the ends of the planking. This method of finishing the planking, slightly modified, is shown in Fig. 101.

In some large ships, the principal transom is called the deck transom. It is situated at the height of the deck and its upper surface conforms

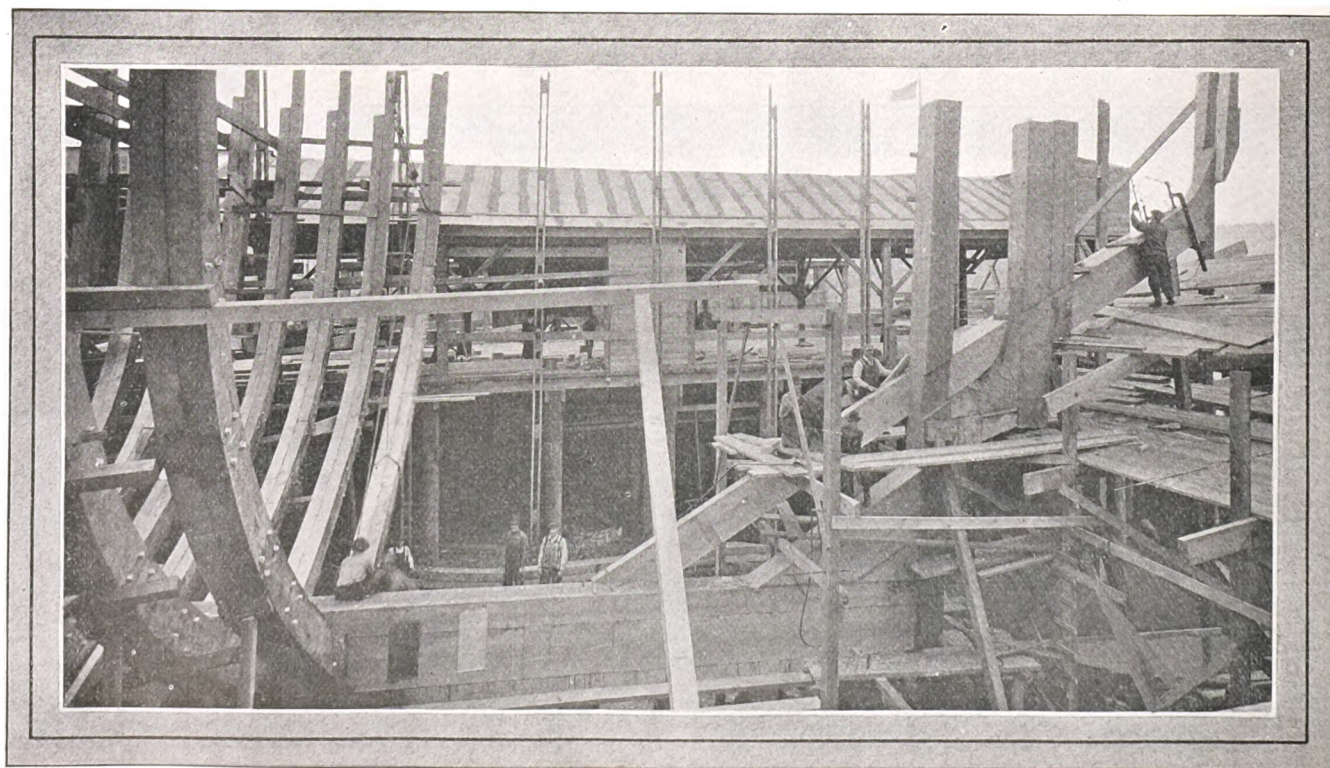


FIG. 105—ERECTING FORE AND AFT POST TIMBERS FOR A STERN OF UNUSUALLY STRONG CONSTRUCTION

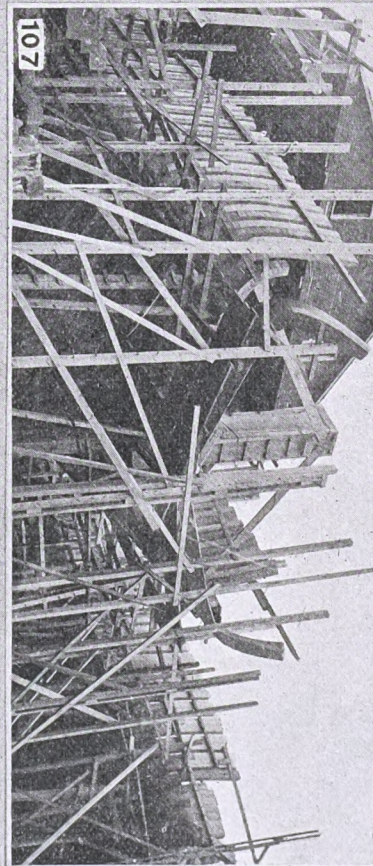
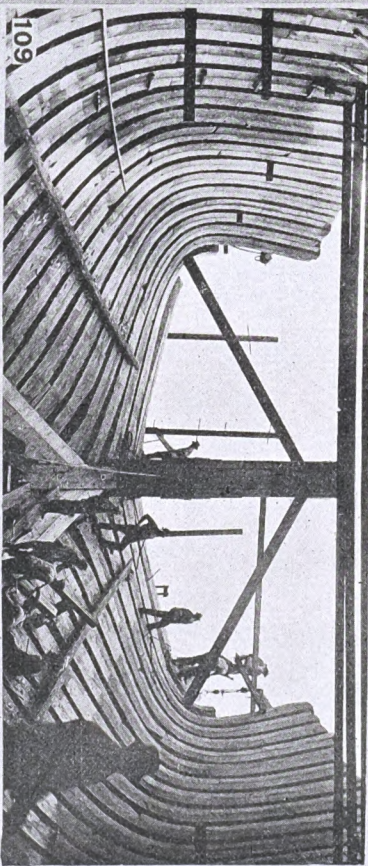
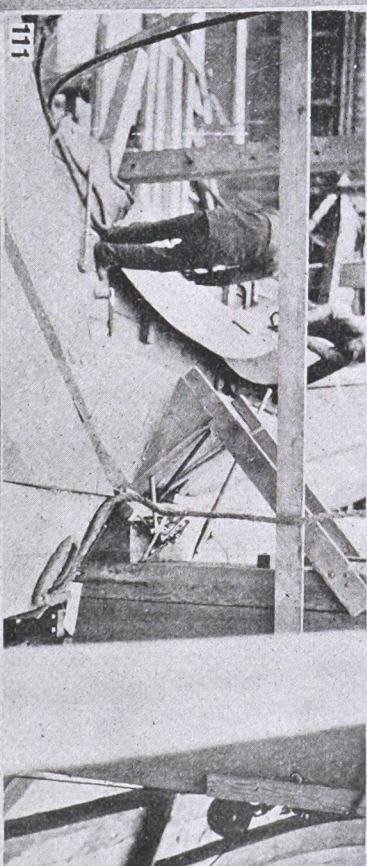
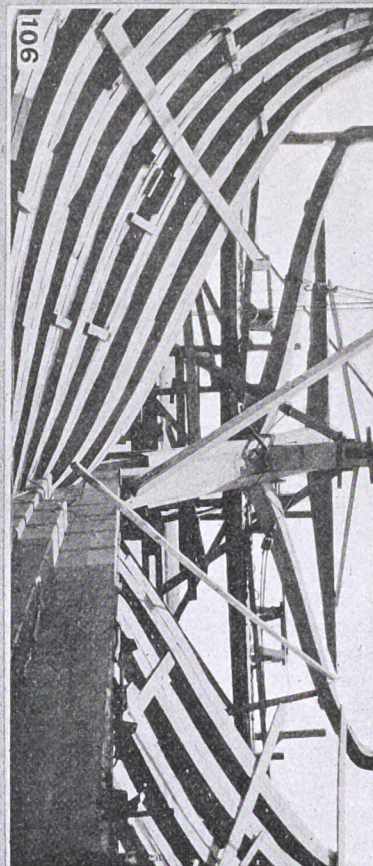
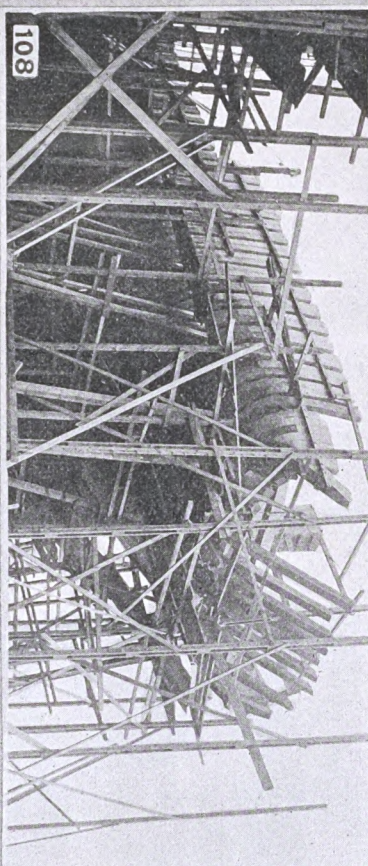
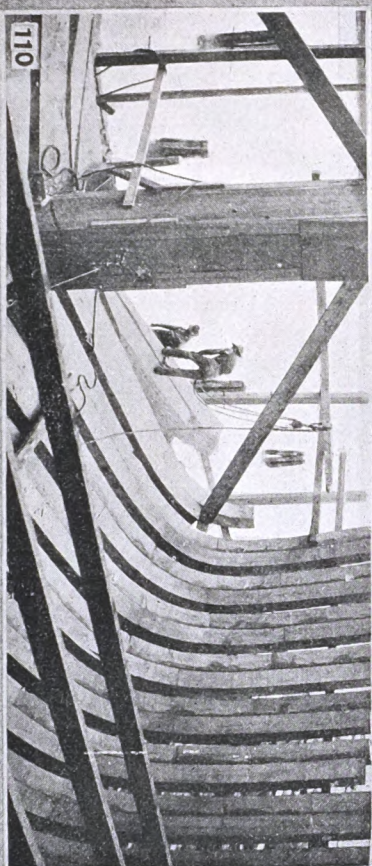


FIG. 106—DETAIL OF TRANSOM STERN FRAMING OF A SHIP UNDER CONSTRUCTION IN A SOUTHERN YARD. FIG. 107—TRANSOM TYPE STERN IN EARLY STAGES OF CONSTRUCTION. FIG. 108—THE NEXT STEP IN THE CONSTRUCTION OF A TRANSOM STERN. FIG. 109—INTERIOR OF A TRANSOM STERN BEFORE TRANSOM TIMBERS ARE IN PLACE. FIG. 110—A CLOSER VIEW OF THE INTERIOR OF THE SAME STERN. FIG. 111—FITTING TRANSOM TIMBERS TO FASHION TIMBER

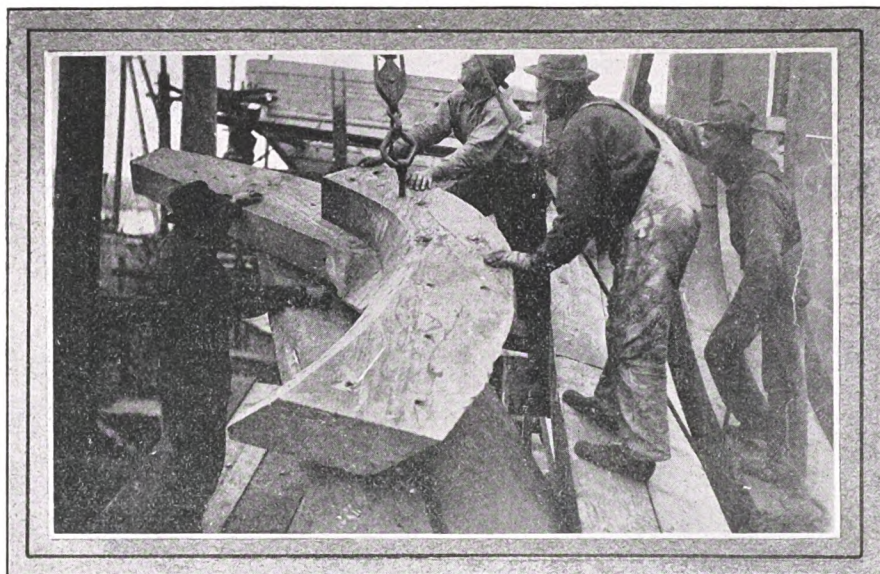


FIG. 112—STERN FRAME ASSEMBLY BEING HOISTED INTO PLACE

to the round up of the beams, being made sufficiently wide to receive the fastenings of the deck planks which stop at a rabbet or score in it. Between the wing and deck transoms certain others are fitted, the number being regulated by the distance between the two main beams. These usually are called filling transoms.

Below the deck transom a series of other transoms may be fitted, sufficient in number to extend from the deck transom to a short distance above the heel of the fashion timber, the space between the lowest and the bearding line being filled in by short canted timbers which are tenoned to the under-side of the lowest transom.

In ships of this character, the transoms below the deck transom are distinguished by number, according to the order of their position below it.

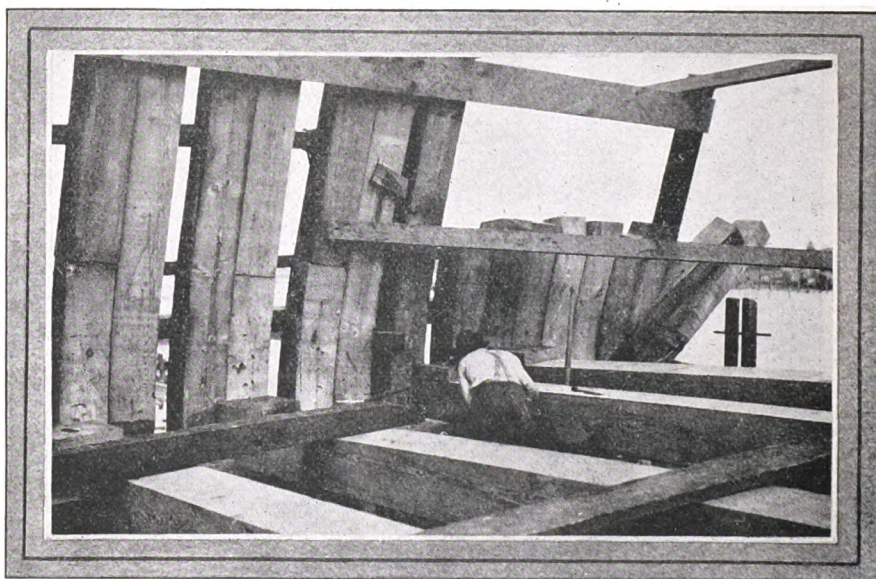


FIG. 114—INSIDE OF FRAMING OF THE STERN SHOWN IN FIG. 113

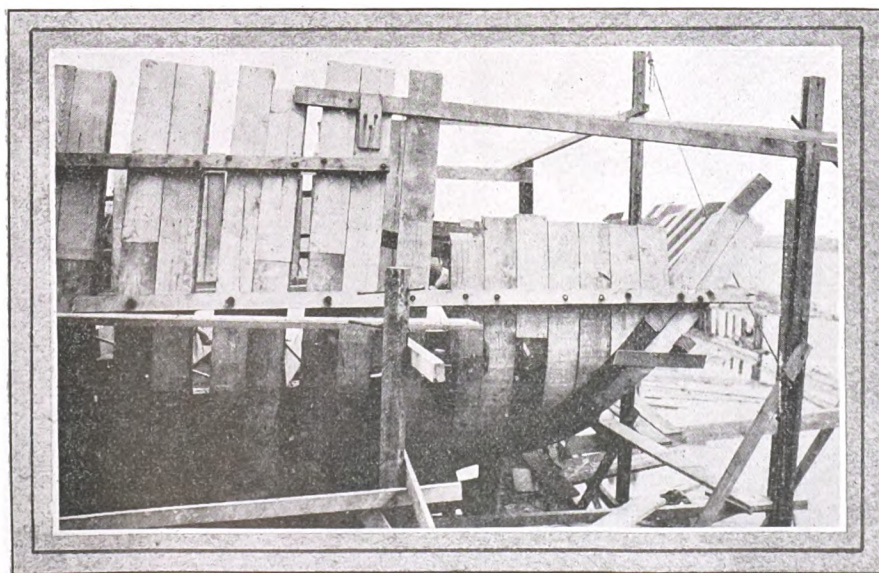


FIG. 113—DETAIL OF FRAMING OF TRANSM TYPE STERN

All except the deck and wing transoms have their upper and lower surfaces in a plane which is either horizontal or square to the after side of the stern post. The deck and wing transoms, however, have their sides trimmed to a surface which partakes of the round of the beam and the sheer of the topsides and deck respectively.

A Trim, Neat Stern

Although certain English writers on naval architecture seem to take pleasure in sneering at the transom stern on the ground that it is ungainly and unworkmanlike in appearance, it can, nevertheless, be made very trim and neat, as Fig. 101 clearly indicates. Also it is relatively simple to construct, cheap, and easily repaired in case of damage. In addition, it offers good resistance to a heavy following

sea. When not hampered by too many restrictions, a good naval architect likes to give earnest consideration to the beauty of his vessel. To accomplish this, special attention is paid to the form of the stern and as already indicated, some architects prefer the elliptical type to the transom type just discussed. Its framing is similar to the transom stern up to the fashion timber. Beyond this point, the framing differs radically.

The upper, aftermost portion of the continuation of the contour of the ship's bottom is termed the buttock. It is usually so flat and nearly horizontal that the only planes which give a definite intersection with it on the drafting board are the vertical longitudinal or buttock planes. Therefore, the buttock lines are of considerable service and are largely employed in

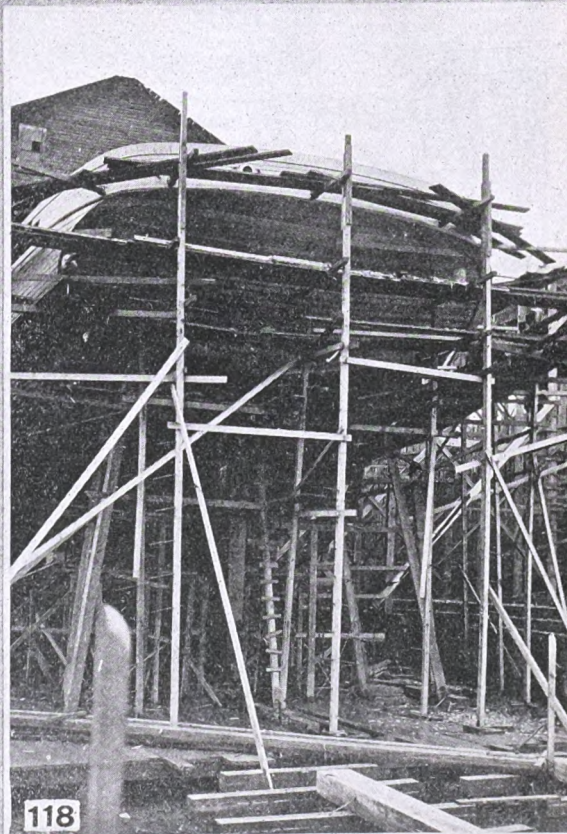
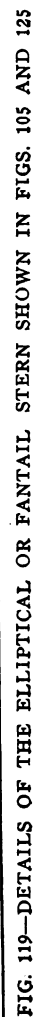


FIG. 115—DETAIL OF STERN FRAMING FROM THE INSIDE OF A SHIP. FIG. 116—ANOTHER VIEW OF THE FRAMING OF THE SAME SHIP. FIG. 117—LOWER PART OF STERN FRAMING OF THE SAME SHIP SHOWING STERN POST, DEADWOOD, ETC. FIG. 118—SAME STERN PLANKED UP AND NEARLY FINISHED



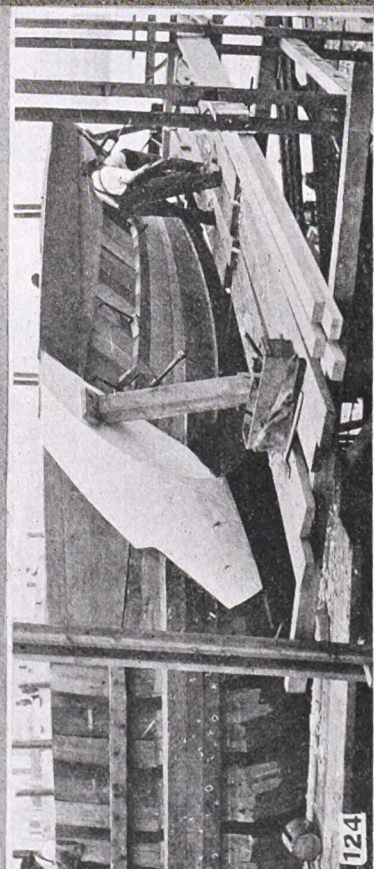
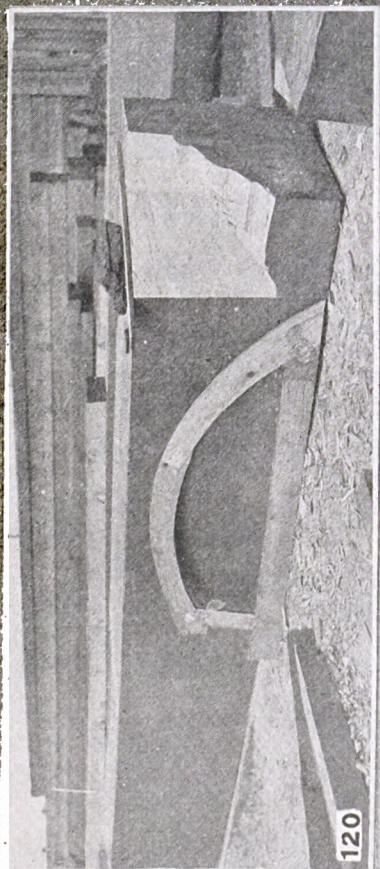
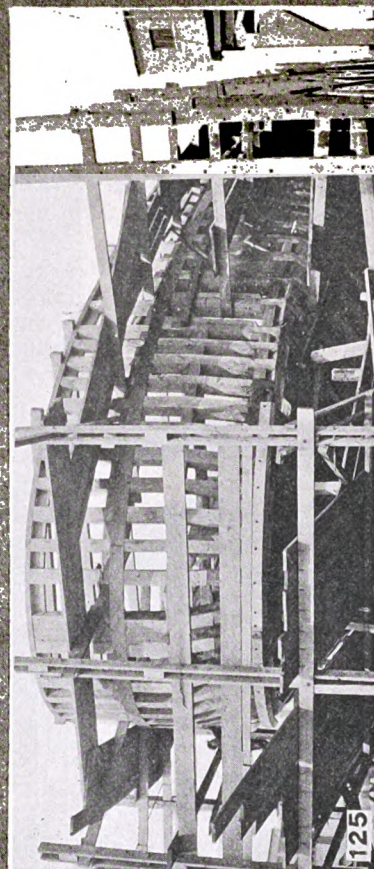
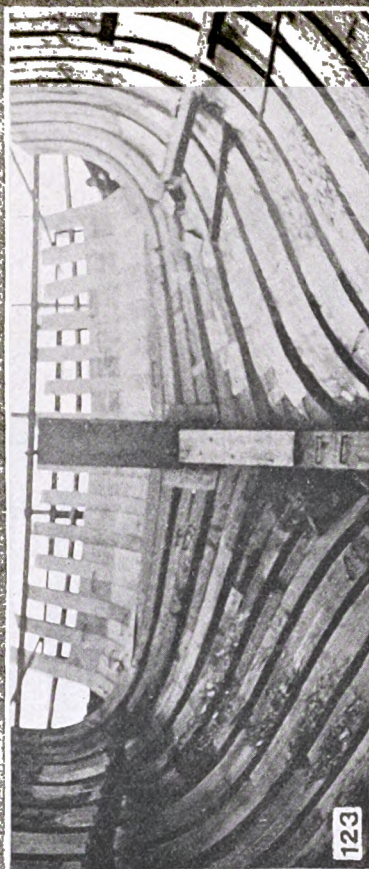
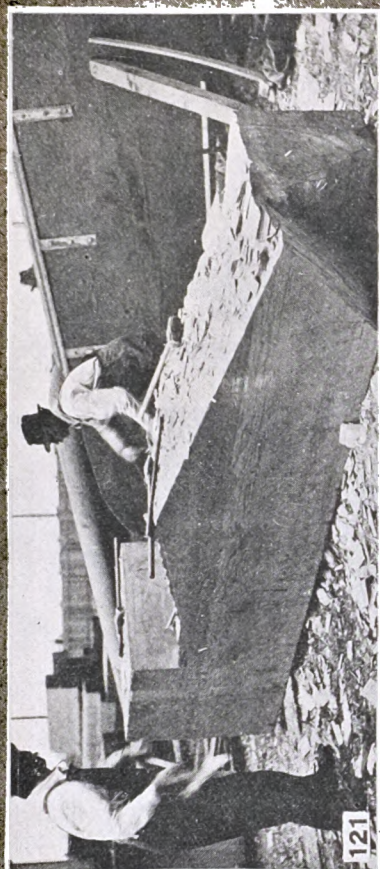


FIG. 120—TIMBER FROM WHICH QUARTER-BLOCK IS HEWED. FIG. 121—HEWING OUT THE QUARTER-BLOCK. FIG. 122—A PAIR OF QUARTER-BLOCKS FINISHED. FIG. 123—QUARTER-BLOCK IN PLACE. FIG. 124—QUARTER-BLOCK LEFT FOR RECEPTION OF QUARTER BLOCKS. FIG. 125—GENERAL VIEW OF ELLIPTICAL OR FANTAIL STERN

fairing this portion of the ship, either in the drawing room or on the mold-loft floor, as described in the chapter appearing in the October issue of *THE MARINE REVIEW*. The buttock lines afford a very accurate conception of the nature of the surface, when studied by an experienced man.

The elliptical stern, when viewed in the sheer plan, rakes aft, the boundary line being straight and making an obtuse angle with the line forming the boundary of the buttock. This angle, which is continued around the stern until the curvature of the buttock breaks continuously into the inward inclination of the ship's side, is

sides of the stern timbers are then inclined so as to be straight lines on this cone. These lines, if produced, will pass through the apex.

The character of the cone is governed by the rake of the stern right aft and the tumble-home of the side as well as by the curvature of the knuckle line. The after extremities of the topside or rail form curves approximating those of an ellipse. Hence the name elliptical stern is given to this style of construction.

The surface of the stern above the knuckle, being approximately an elliptical cone, and the surface of the stern below the knuckle a continua-

short cants which, like the quarter-timbers, are heeled upon the fashion timber. Quarter-timbers and those abaft them are known by the generic name of stern timbers. In disposing these stern timbers it is necessary that they should be canted in such positions as will avoid excessive beveling. At the same time it is necessary for the timbers to heel on the fashion timber or on a short cant which itself heels upon another stern timber. Sometimes it is necessary to give the stern timbers a double cant.

The chief feature of the parabolic stern is the absence of a knuckle. This stern, therefore, becomes a con-

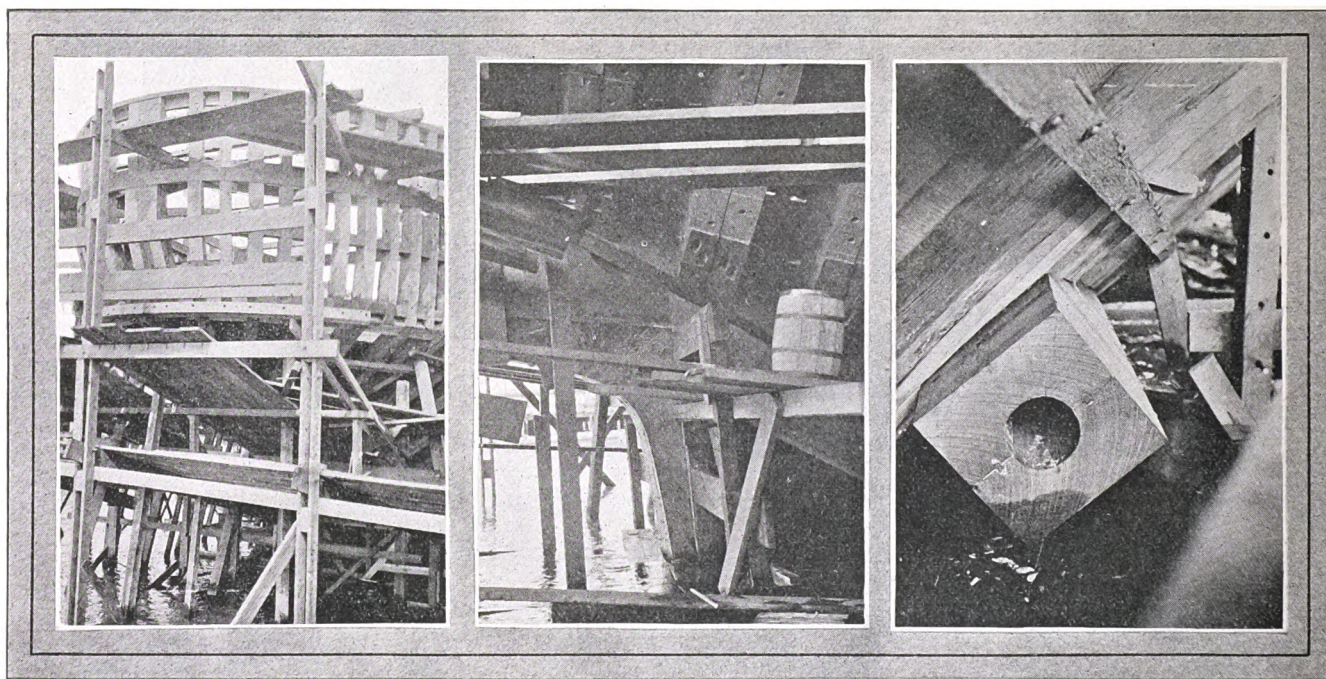


FIG. 126—ANOTHER VIEW OF THE STERN SHOWN IN FIG. 125. FIG. 127—NATURAL KNEE USED TO CONNECT STERN-POST TO OTHER STERN ELEMENTS. FIG. 128—SHAFT LOG IN TWIN-SCREW MOTOR SHIP

termed the knuckle. This knuckle is shown clearly in Fig. 129. In the sheer draft, showing the lines of the ship, it is called the knuckle line.

Now on account of the inward inclination or tumble-home of the ship's side and the rake of the stern right aft, the surface of the ship's side between these limits must necessarily be twisted. Now it has been found that if square openings are cut in such a stern they are very unsightly. Round portholes, therefore, are much to be preferred.

In order to give this type of stern a still more pleasing appearance, the following procedure may be adopted. Produce upward indefinitely the line of rake right aft. Now draw a line from the end of the knuckle line in the direction of the tumble-home of the side. The point of intersection of these lines may be chosen as the apex of a cone containing the knuckle line and enveloping the stern. The

tion of the contour of the ship's bottom, it remains to be decided just what kind of a line the knuckle shall be. It is evident that although the former surface may be invariable, it is possible to modify the surface of the bottom, consistent with fairness, so that the position of the knuckle may be varied slightly to suit appearances. It is customary to place the knuckle line in the surface containing the upper sides of the beams of a deck, both for the sake of beauty and to suit the internal arrangements of the ship. Therefore, the knuckle line conforms to the round of the beam and the sheer of the deck.

In disposing the timbers in an elliptical type stern, the quarter-timbers are so placed that their edges are straight lines on the cone surface just where the latter blends into the surface of the topside. Spaces between these and the aftermost fashion timber are filled up by a number of

timbers forming the backbone, as it were, of the ship abaft the body post. These timbers are close jointed from the gunwale to the body post. Boxen wood is left on the post timbers to house the aftermost ends of the side and bottom planks in this form of construction. Instead of the complicated arrangement of timbers required by the systems previously described, the framing of this type of stern consists of ordinary cants. Those before the screw aperture heel against the deadwood and those abaft it heel against the sides of the post timbers. It is not necessary to go into detail regarding methods of laying off these timbers. The post timbers are laid off in the sheer plan on the mold loft and the remaining timbers, as previously stated, are ordinary cants.

In most modern wooden ships the sternpost simply heels square against the keel and after ends of deadwood.

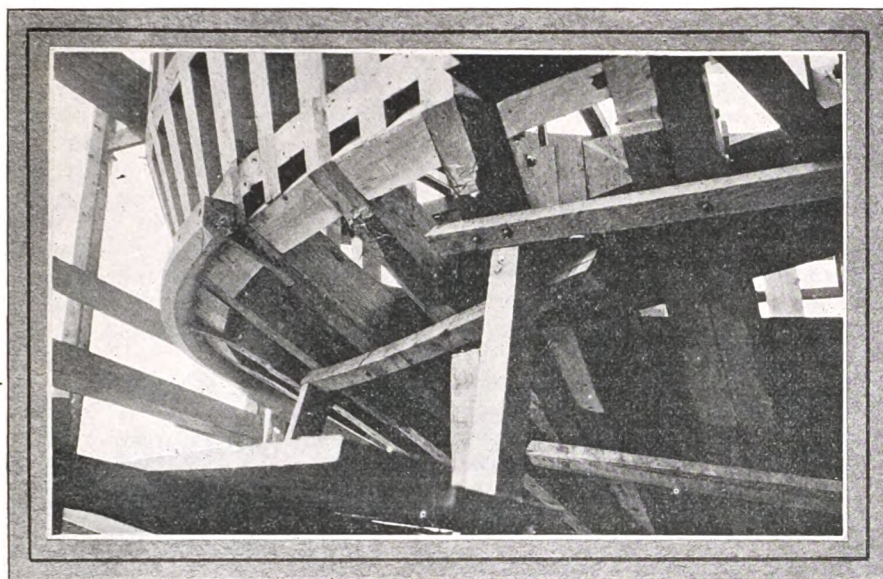


FIG. 129—DETAIL OF FANTAIL STERN CONSTRUCTION AT KNUCKLE LINE

Frequently a heavy wooden knee is inserted in the angle between the post and upper side of the deadwood. This construction is clearly shown in Fig. 119.

The sternpost and other sections of the stern frame may be raised into position with a traveling crane such as that previously described for handling frames and bow timbers, or, if necessary, simple derricks, or gin poles may be used. After the sternpost is in place it may be used to support the tackle employed to handle some of the other timbers.

Most ship builders raise the rudderpost by itself, hanging the rudder later. In some cases, however, the rudder is assembled to the rudderpost on the ground and the whole combination raised at one time. This method of raising the rudder and rudderpost, together with the fashion timber in a single assembly is shown clearly in Figs. 102 and 104. It is said by the builder that this method of handling the problem saves \$50 in labor cost. Fig. 104 shows clearly how the assembly looks before the after cant frames and stern timbers are in place. A more detailed view is shown in Fig. 102.

Handling Small Stern Timbers

For handling the smaller stern timbers, simple block and tackle arrangements such as those illustrated in Figs. 110, 111 and 112, usually are employed. These illustrations show various stages of the stern framing of a transom-stern, 5-masted auxiliary schooner built at the plant of the Grays Harbor Shipbuilding Co., Aberdeen, Wash.

Fig. 112 is particularly instructive. It will be noted that the irregular pieces of the stern are hewed out, beveled and assembled as far as pos-

sible on the ground. The various sections are fastened together by iron drift bolts. The assembly is then hoisted into place with a block and tackle connected to an eye bolt which is temporarily screwed into the piece. After the assembly is bolted in its proper place in the ship, the eye bolt is removed.

The various stages in framing the transom stern shown in Fig. 101 are clearly illustrated by Figs. 107, 108, 109, 110, 111, 112 and 118. Fig. 107 shows the framing before the transom timbers are in place. In Fig. 108 part of these timbers have been set in their proper positions, Figs. 109 and 110 show inside views of the same stern. In the latter, the arrangement of the sternpost and aftermost frames is clearly indicated. Fig. 109 shows how the ceiling fits up against the keelson and sternpost in the after

part of the ship. The method of assembling some of the transom sections will be understood by studying Figs. 111 and 112.

The framing of a transom stern in a schooner building in a Georgia shipyard is shown in Fig. 106. In this case, natural bent crooks are used which adds considerably to the strength of the structure. The deckhouse shown in Fig. 101 protects the steering gear. The character of the scaffolding necessary around the stern when the ship is under construction is shown clearly in Figs. 107, 108 and 118. The latter illustration shows a transom stern planked up and nearly completed. As shown in Fig. 113, the side counter timbers are double. The triangular space between them and the aftermost frame is filled in with short cants which heel against the side counter timbers. These pieces, or cants usually are sided about 8 inches and molded about 10 inches. Until the planking is bolted in place, they are lightly spiked to a ribband, as shown in Fig. 113. The interior of this part of the same stern is shown in Fig. 114, which also illustrates the after main frames and the arrangement of the deck beams in the way of the stern. Further details of this type of stern framing, in an earlier stage of the construction process, are shown in Figs. 115 and 116. These illustrations show quite clearly how the after stern frames are formed and how they heel against the sternpost and after portion of the deadwood. The arrangement of the ceiling near the stern post also is suggested.

Lower Part of Stern

The lower part of this same stern is shown in Fig. 117. This illustration clearly indicates the arrangement

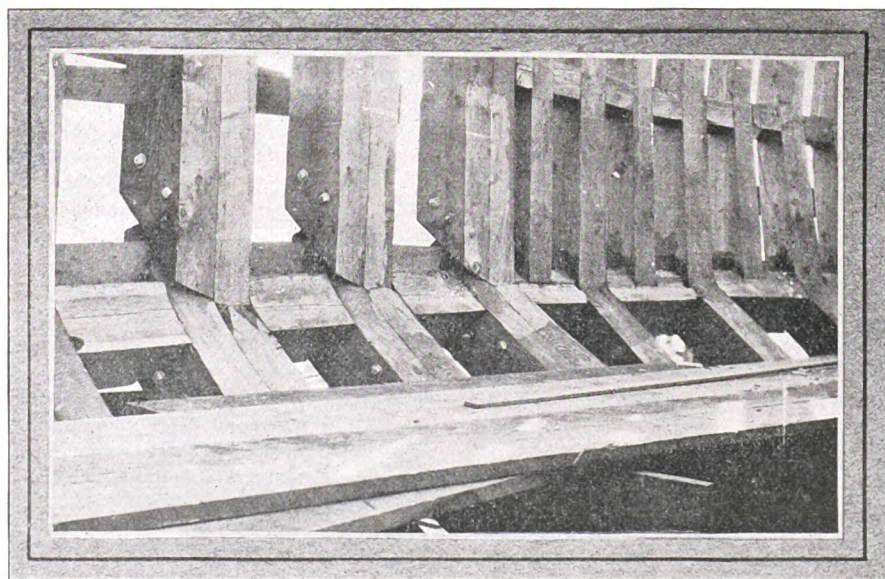


FIG. 130—ARRANGEMENT OF TIMBERS INSIDE THE SAME STERN AT THE POINT SHOWN IN FIG. 129

of the sternpost, deadwood and the heels of the after frames. The three bronze sockets for the rudder pintles also are shown. In addition, the shaft log for one of the twin screws may be seen at the extreme left of the illustration.

In another form of transom stern, illustrated in Figs. 120 to 124, inclusive, a quarter-block is employed to fill out the corners of the transom, instead of using short cants heeling against the side counter timber, as shown in Fig. 113. Some builders think the quarter-block construction is neater. Also it saves considerable detail work in fitting up the framing and is a help to the designer if he is a little shy on geometry. But as indicated by Fig. 120, the quarter-block is rather wasteful of timber. This illustration shows the baulk from which the block is hewed. A piece 36 inches square and about 10 feet long is required to make each block. One of the curved molds from which the block is hewed is shown in the foreground of Fig. 120.

Fig. 121 shows the quarter-block being hewed out. Two men are employed and it is essential that they have considerable skill in order to turn out a neatly finished block. Two completed blocks, ready to go into the ship, are shown in Fig. 122. The strip shown nailed on the side of the block is placed there simply for convenience in handling. A detail of the arrangement of the frames in the way of the stern, showing the holes left for the reception of the quarter-blocks is shown in Fig. 123. Fig. 124 shows the block in place, and indicates how the after-ends of the planking close against the rabbet formed by the block. This illustration also shows clearly how the transom is framed, using clamps to hold the planks in place before they are spiked down.

A Fantail Stern

The details of a neatly formed elliptical or fantail stern are shown in Figs. 125 to 127. Figs. 129 and 130 show close-up details of the same stern. This stern is framed with timbers sided $7\frac{3}{4}$ inches. The details of the knuckle joints are clearly shown in Fig. 129, the interior of the same joints being illustrated by Fig. 130. Bolted construction is employed.

The fastenings and other details of this stern are shown completely in Fig. 119. As this illustration indicates, liberal use is made of natural knees, there being three fayed against the sternpost and one against the rudderpost. As Fig. 119 also indicates, the various parts are very thoroughly drift-bolted together. The sternpost is $23\frac{1}{2} \times 19\frac{1}{2}$ inches in section and 30 feet in length. The rudderpost is

$19\frac{1}{2} \times 23\frac{1}{2}$ inches in section, the same as the sternpost, and 18 feet in length. The main piece of deadwood is $23\frac{1}{2} \times 30$ inches, 38 feet in length. The knee which fills the angle between the sternpost and deadwood is 6 x 6 feet, sided $23\frac{1}{2}$ inches.

In general, it will be noted that this stern consists of cant frames stepping on two fore and aft post timbers or whiskers. These timbers, as indicated by Fig. 119, are $9\frac{1}{2} \times 26$ inches in cross section and 44 feet in length. They are notched into the sternpost and rudderpost and are continuous from the deadwood to the knuckle line. The space between the post timbers is taken up by filling blocks sided $17\frac{1}{2}$ inches. The general arrangement of the fore and aft post timbers or whiskers is shown clearly in Fig. 105, which illustrates this stern in an early stage of construction. The post timbers are equivalent to a continuation of the deadwood and the aftermost cant frames heel against them.

Fig. 128 shows how the shaft log comes through the stern frame on a twin-screw motor ship. In this case, the log consists of two timbers bolted and doweled together. The outer end of the shaft, just ahead of the propeller, is further steadied by a steel truss, the details of which are shown in Fig. 119.

Peace Must Bring Big Export Trade

(Concluded from page 441)

be enabled to freight our products to foreign markets at a cost not exceeding that which will be available to our competitors, and this will be possible only if we have an American merchant marine unhampered by restrictions from which our chief competitors are free.

The British shipping industry which for generations has been and still is by far the greatest in the world, was built up by the exertions of the men engaged in it. It prospered because it was free from restrictions to which its competitors were subject. Theories to the contrary notwithstanding, we cannot have, in time of peace, an American merchant marine worthy of the name unless it be profitable to operate it without subsidy or subvention. This is manifestly not possible upon any practical or permanent basis so long as it costs more to operate an American steamer in ocean-going commerce than a foreign steamer in the same trade. Unsubsidized steamers have always been able to make a better showing for their owners than the subsidized ones and it is certain that while a large majority of the British lines have received no subsidies from their government, they

have nevertheless grown and prospered and have found no difficulty in competing with the subsidized lines.

I repeat that what is necessary for the future growth and success of the American merchant marine is that it be placed upon a footing of equality with its chief competitors; with a fair field and no favor, repealing all laws which experience has shown to be detrimental to its growth, thereby leaving American enterprise free to achieve a success equal to that which the British shipping industry, unhampered by restrictive laws, has been able to accomplish.

Book Review

Navigation, by Harold Jacoby; cloth; 330 pages, 5 x 8 inches; published by the Macmillan Co. and furnished by THE MARINE REVIEW for \$22.25 net.

The ability to navigate a ship is a valuable asset these days when new merchant vessels are sliding off the ways in unprecedented numbers. "Navigation" is an exposition of this art. It is written in simple language which the beginner can easily comprehend. The author has not assumed that the reader possesses formal mathematical and astronomical knowledge, or desires to possess it. Whenever methods of navigation require for their demonstration an understanding of spherical trigonometry, or other branches of formal mathematical science, such demonstrations have been replaced with incomplete or "outline" demonstrations, designed for the non-mathematical reader. Practical methods are fully explained.

The subject has been treated in a somewhat informal manner for the benefit of those who may study without a teacher. Such topics as the use of logarithms, or the principles on which mathematical tables are constructed are not presented in a special chapter, but are described in a sort of digression, when needed in the discussion of an actual navigation problem.

The final 169 pages are devoted to essential nautical tables. In order to give enough information without unduly extending the size of the volume certain of these have been abridged. All are given in sufficiently extended form to permit of actual navigation with their aid, however. The author has limited his discussion to methods of navigation considered best by the most reliable modern authorities.

The United Shipsmithing Co., San Francisco, has been incorporated by F. A. and M. D. Schaumleffel and A. M. Geisler with a capital stock of \$5000.

The Motorship Construction Co., Vancouver, Wash., which has a contract for over 300 lifeboats and liferafts, is erecting a 75 x 150-foot addition.

On the Coasts, Lakes and Rivers

What's Doing and Who's Doing It

Activity on Lakes as Year Nears Close

By C. M. Krauss

THE ruling governing the collection of the internal revenue tax on transportation charges is in part as follows:

The 3 per cent transportation tax under section 500 war tax act, Oct. 3, applies to transportation on lake bulk freighters but only between ports of the United States, becoming effective Nov. 1, 1917. This tax is payable not by the vessel, but by the party who pays for the transportation. The vessel, however, is charged with the duty of collecting the tax with her freight and accounting monthly, and if she fails to collect the tax she must answer for it herself, the same as if she had collected it. Bills of lading on shipments subject to tax should have tax noted thereon and included, being 3 per cent on the gross freight. Grain shipped by the government is not taxable and vessel men do not have to collect the war tax on such cargoes.

Vidal shoals channel gas buoy No. 1 was moved in a northerly direction about 400 feet to keep vessels in the northern half of the Vidal shoals channel during dredging operations in the southern half of the channel. When the southern half of the channel is cleared, the gas buoy will be moved back to its former location and a temporary red spar buoy will be established on Vidal shoals channel range in a line between Vidal shoals junction gas buoy and Vidal shoals channel gas buoy No. 1 to keep vessels in the southern half of Vidal shoals channel while the northern half is being dredged.

The Lakeside Steamship Co., Duluth, sold the wooden steamer ALFRED MITCHELL to J. M. Scott, Mobile, Ala. She is 270 feet long, 40 feet beam and 25 feet deep. Ten feet will have to be taken off her stern to enable her to make the trip through the Welland canal.

The barge ALOHA, Midland, Ont., foundered during a storm opposite Nine Mile point, west of Kingston, Lake Ontario, and sank. The captain, David McVicar, was drowned, but other members of the crew were saved. The ALOHA was being towed from Erie, Pa., to Kingston by the tug C. W. CHAMBERLAIN. She carried 925 tons of coal.

The steamers AMERICA and NORTHERN QUEEN, which were cut in two and towed to Montreal, were connected without being docked. The AMERICA was put together in about two hours. The vessels were docked for riveting the bottom of the hulls.

L. E. Dunham has been appointed director of purchases of M. A. Hanna

& Co., Cleveland. Mr. Dunham has been connected with the ore sales department of the Hanna company for 14 years.

The tonnage carried through the American and Canadian locks at Sault Ste. Marie during October amounted to 12,646,060 tons, including 34,714,844 bushels of wheat and 8,132,288 tons of iron ore.

The steel freighter WAR HONOUR was launched Nov. 3 at the Wyandotte yard of the Detroit Shipbuilding Co. The vessel, which is Welland canal size, was taken over by the United States while under construction for British interests.

Two large ocean freighters are under construction at the yard of the Superior Shipbuilding Co., Superior, Wis., for the Cunard line. The plant, it is stated, also has contracts for several ships for the United States Emergency Fleet Corp. Four freighters have been launched this year at the company's yard.

The steamer W. S. MACK has been sold by the Valley Camp Steamship Co. to the Sault Shipping Co., Sault Ste. Marie. The MACK is 346 feet keel, 48 feet beam and 28 feet deep and has a capacity of 5500 tons.

Capt. Charles Bennett, Buffalo, has received an appointment as first lieutenant in the auxiliary naval reserves.

The first of the mine sweepers being built for the government by the Buffalo Drydock Co. was launched at the company's yard Oct. 18. The ceremony was witnessed by a large number of people, including Lieutenant Commander Salisbury, Lieutenant Commander Lee and Lieutenant Gayheart, of the navy. The mine sweeper is 178 feet keel by 30 feet beam.

The wrecked steamer PENTECOST MITCHELL, which was sunk at the mouth of the St. Marys river last May after colliding with the steamer SAXONA, will be repaired at the yard of the Toledo Shipbuilding Co. The PENTECOST MITCHELL is badly damaged and will not be ready for service until next season.

The Lake Erie Drydock & Mill Co., Sandusky, O., has been incorporated to operate a shipbuilding plant in East Sandusky with \$1,600,000 capital stock.

The barge ABYSSINIA, which went ashore at Tecumseh reef on the Canadian shore of Lake Erie, was badly damaged and has been abandoned by her

owners, Hutchinson & Co., as a total loss. The boat was worth approximately \$200,000, and she carried about 15,000 bushels of wheat. Neither the vessel nor the cargo were insured.

A pile driver, owned by John Ginzel, was lost on Oct. 15 off Muskegon harbor, Lake Michigan, while being towed from Grand Haven to Manistee. It is 48 feet 6 inches long, 20 feet 8 inches wide and 4 feet 6 inches deep, with leaders 46 feet high. The wreckage is about 1 1/4 miles south by west from the Muskegon pierhead light, with timbers and angle irons showing above the water about 4 feet.

The American Shipbuilding Co. launched steamer No. 84 at its South Chicago yard Oct. 13. The boat, which is full Welland canal size, will be sent to the coast.

Capt. W. C. Brown, St. Clair, Mich., who has been commanding lake vessels for 44 years, is resigning as master of the steamer HOOVER & MASON, of the Tomlinson fleet. He began his career on the lakes in 1865 at the age of 14 years. Captain Brown has the excellent record of having delivered every cargo taken out by a boat in his command and never having lost nor gone ashore with a ship. He will retire from the lakes.

The Canadian General Electric Co., Ltd., Toronto, has received an order for four steel freighters of 3500 tons each for the British government. They will cost approximately \$3,000,000. The hulls will be built at the Bridgeburg plant and the engines and accessories at the Toronto works.

Two of six trawlers building for the Canadian naval service department were launched at the yard of the Collingwood Shipbuilding Co., Ltd., Oct. 1. The boats are of the regular North sea trawler type and are 135 feet long, 23 feet 6 inches beam and 13 feet 6 inches deep.

The steamer GEORGE A. GRAHAM, owned by the Montreal Transportation Co., Montreal, broke in two after stranding at South bay, Manitoulin island, Georgian bay, Oct. 8. She will probably be a total loss. The boat was insured for about \$125,000. She was built in 1891 and was 292 feet long, 40 feet beam and 24 feet deep.

Capt. John T. Autterson, who has been sailing the steamer W. A. ROGERS, brought out the steamer WILLIAM A. AMBERG, the third vessel built at the Lorain yard of the American Shipbuild-

ing Co., for the Producers Steamship Co., M. A. Hanna & Co., managers.

* * *

The barge TOKIO collided with the barge HOMER, Detroit, in the St. Clair river, Oct. 9, and sank to the bottom on the American side of the river. The TOKIO is on the bank and is not an obstruction. The HOMER was only slightly damaged.

* * *

The steamer J. S. DUNHAM sank after colliding with the steamer ROBERT FULTON opposite Grassy island in the lower Detroit river on Nov. 5. The FULTON went aground near Grassy island and is badly damaged. The DUNHAM, which carried a cargo of ore, is owned by the Chicago Navigation Co., D. Sullivan & Co., managers, and is insured. She is 420 feet long. The FULTON is owned by the Pittsburgh Steamship Co. and is not injured.

* * *

The Globe Shipbuilding Co., Superior, Wis., has launched the first of eight steam trawlers building for the Bay State Fishing Co., New York. She was christened the SEA GULL and cost \$150,000. The Globe company is now constructing two large ocean freighters which were ordered by a neutral country but which will be requisitioned by the United States government.

News of Boston Harbor

By George S. Hudson

Volunteer Harbor No. 4, Masters, Mates and Pilots, of Boston, has elected officers as follows: President, Capt. Edward Gray; vice president, Capt. J. A. Barber; second vice president, Capt. Alfred Carleton; treasurer, Capt. R. J. Lerson; secretary, Capt. Charles Collins; chaplain, Capt. James Coughlin; trustee, Capt. Charles Dolan.

* * *

German sailors, 278 in number, have been transferred from a camp on Gallop's island, Boston harbor, to Hot Springs, N. C.

* * *

Schooner FLORENCE CREADICK, damaged by shell fire while bound from Philadelphia for France, has been sold to French account on arrival at Brest.

* * *

Crews of the two sister steamships, ITASCA and NEW ORLEANS, have been landed at Boston. The ITASCA foundered while bound from Bermuda for New York, Capt. H. J. Bond being drowned. Twenty-three survivors were picked up by the SAN MATEO after having been 10 days in an open boat. The NEW ORLEANS also foundered while bound coastwise, Capt. C. H. Lawrence and 26 men being rescued by the steamer LEXINGTON immediately after abandoning the ship.

* * *

A fleet of sailing vessels is bound from South Africa for Boston with cargoes of wool, having been chartered because of scarcity of steam tonnage. One ship made the passage from East London in 69 days. Square-riggers are also returning to trade between the Orient and Boston, thereby releasing steamers for service between this country and Europe.

* * *

Schooner MARY F. CURTIS, commanded by Capt. Lemuel Firth, has stocked \$82,000 in the Boston mackerel fishery this season, each of the crew receiving

\$1900. This is a record never before approached in the Massachusetts industry.

* * *

Boston schooner DAMIETTA & JOANNA has earned in freight money double her cost in a few months, having made one voyage to France. She is now chartered to carry lumber from a gulf port to Porto Rico at \$26 per 1000.

* * *

John Chisholm has named a new fishing schooner MARNE. This is the first time that a local owner has selected

a battlefield of France for that purpose. The MARNE will be employed in the local industry.

* * *

Boston schooner SULLIVAN SAWIN was lost on Great Inagua island, W. I., in a hurricane. She was built at Bath in 1874 and registered 500 net tons.

* * *

Schooner HERMAN F. KIMBALL, at Boston from Rockport, Me., had part of her cargo of 1500 barrels of lime damaged by fire while waiting to move to a discharging berth.

Along the Pacific Coast

By Robert C. Hill

SHIPBUILDING activity on Puget sound is again in full swing following a cessation of work for three full weeks at a majority of both wood and steel plants. The visit of the labor adjustment board of the Emergency Fleet corporation, which held hearings at Seattle for a week, had a salutary effect on the entire situation and on Oct. 22 about 4500 steel shipyard workers of the 8500 who walked out on Sept. 29, returned to their tasks. Since then the various yards have recruited their employees up to the former numbers. An earlier resumption might have resulted but for the attitude of the boilermakers who at first refused to accept the tentative terms. This organization finally, by a vote of 2696 to 1457, decided to return to the yards, on the promise of the board to promptly adjust the question of wages and working conditions. This settlement will be announced within a few days.

* * *

The question of 8-hour lumber, which resulted in a walkout of union carpenters several weeks ago, is no longer an issue, the shipwrights, on receipt of a telegram from Secretary of Labor Wilson, having voted to withdraw from their decision to handle only 8-hour lumber. The government appealed to the men on patriotic grounds and the wooden yards are again humming with activity. The only discordant note is a walkout at the Sloan yards, Olympia, where minor differences between the employers and the men resulted in a cessation of work. This, however, is likely to be adjusted without difficulty.

* * *

Recent government surveys have indicated the present splendid condition of the Columbia river bar, which now is declared to be one of the best bar harbors on either coast. This improvement is attributable to the work done in the last three years by the government dredge CHINOOK. Three years ago the maximum depth at low water on this bar was 23½ feet. The late measurements show a depth at low tide of 40 feet in a channel 1300 feet in width, a depth of 42 feet in a channel 1000 feet wide and 38 feet in a channel 2000 feet in width. These figures indicate that the Columbia river can accommodate the largest vessels afloat.

* * *

Extensive construction work is to be done at Victoria, B. C., where a shed 200 x 703 feet is to be built for assembling marine engine parts. The contract has just been awarded to Grant, Smith & Co. The imperial munitions

board is to use the new ocean docks, Pier 2, as an assembling plant in connection with the installation of the machinery in a fleet of 27 wooden steamers, now on the ways. The shed will be one of the largest on this coast and its construction will require 2,000,000 feet of lumber.

* * *

Since the return of the metal workers, the Seattle Construction & Drydock Co. has had a busy siege with general contract and repair work. Among the vessels recently docked by this plant are the Norwegian steamer LUISE NIELSEN, fishing steamer ZAPORA, steamers BEE, SPOKANE, FULTON, POTRERILLOS and barkentine E. R. STERLING.

* * *

Loss in Alaskan waters of the wooden steamer AL-KI removes from the Pacific coast fleet another historic vessel. The AL-KI was built at Bath, Me., in 1884, and since 1898 she has been operating between Seattle and Alaska. In the 19 years in question she has figured in a number of mishaps and was a familiar figure to thousands of Alaskans. The vessel went ashore in a blinding snow storm and soon broke up. No lives were lost.

* * *

The lighthouse tender KUKUI, which has been in service in Alaska for a year, will be docked and repaired at Seattle before proceeding to Honolulu to exchange places with the tender COLUMBINE. Bids for repairing the KUKUI were received as follows: Winslow Marine Railway & Steamboat Co., \$5007; Seattle Construction & Drydock Co., \$5307.

* * *

Extensive improvements are being completed at the plant of the Skinner-Eddy Corp., costing about \$1,000,000, the yard now representing an investment of \$4,000,000. On property recently acquired, two big ship outfitting wharves, each 65 x 850 feet, are being built. At these piers eight large steamers can be accommodated at one time while engines are being installed and finishing touches put on. The company's plant now covers 27 acres. Dredging has deepened the ship berths and the material has been used for filling in additional space. A 250-foot machine shop is also being built and another foundry is to be added shortly.

* * *

For service between San Francisco and Honolulu, the Pacific Steamship Co.'s fast liners PRESIDENT and GOVERNOR will be withdrawn from the Seattle-California route this month. The

Pacific Steamship Co. will replace them with others of their fleet, maintaining service to San Francisco and San Pedro but eliminating the direct call at San Diego.

* * *

The eighth steel steamship launched by the Skinner-Eddy Corp. since Jan. 1, 1917, the WAR FLAME, took to the water Nov. 1, with Mrs. Alice B. Keil as sponsor. What is said to be a countrywide record was established on this vessel, her launching taking place 64 working days after the keel was laid. The next best record made by this yard was 78 days on the JEANNETTE SKINNER.

The WAR FLAME is a duplicate of the NIELS NIELSEN, 423 feet in length. Three more steel hulls are to be launched from this plant before the end of the year. The WAR FLAME was built to the order of the Cunard line.

* * *

Other launchings of the past month include the wooden steamship HOLLYWOOD, 3000 deadweight tons, at Bellingham, Oct. 31, and the wooden steamer CLAREMONT, from the Matthews yards, Hoquiam. The latter vessel is 240 feet in length and has a lumber capacity for 1,400,000 feet.

Notes From the Gulf Coast

By H. H. Dunn

CHARGED with the mission of speeding-up the emergency fleet program on the gulf coast, three experts attached to the shipping board are touring the lumber manufacturing and shipbuilding plants of the South, from Texas to Florida. The men are: Col. Edwin A. Stevens, field officer of the Emergency Fleet corporation; A. C. Powers, chief timber inspector of the navy yard at Norfolk, and J. B. Eccleston, also of the shipping board. The United States needs ship repair plants even more than it needs shipyards, according to Colonel Stevens.

* * *

So great has been the demand for marine engineers that the shipping board's free school of marine engineering at Tulane university, New Orleans, has been extended one month, beginning Nov. 1, with a larger attendance than at any other time since the school's inauguration on July 2, 1917.

* * *

Greenwood, Miss., has begun work on a concrete wharf, to cost \$100,000, and to be built under direction of federal engineers.

* * *

Contract for the construction of the hospital and other buildings at the Gulfport, Miss., naval station has been let to John W. Griffith & Son, for \$436,000. The 130 buildings specified in the contract must be completed in 80 days from Nov. 1.

* * *

The municipal government of New Orleans is considering a plan to ask the state legislature to pass an enabling act whereby the city may purchase the several ferries operating across the Mississippi river, between New Orleans, Gretna, Algiers and McDonoghville, suburbs of the city. Most of the franchises of these ferries expire within the next year.

* * *

Leon Locke, Lake Charles, La., has filed with the federal engineers in New Orleans, the deeds for the rights-of-way of that section of the intercoastal canal between the Mermentau and Calcasieu rivers. The money has been appropriated and the government will let the contracts as soon as the 42 deeds to the rights-of-way have been approved.

* * *

The 200-ton gasoline boat MERIWETHER has begun freight and passenger service between New Orleans and points in

Tangipahoa parish, opening a new trade territory to New Orleans merchants.

* * *

Right of the board of commissioners of the port of New Orleans to re-measure ships to include the shelter deck as part of the freight carrying capacity has been upheld by the supreme court of the United States by refusal to entertain a writ of certiorari in the case of the steamer CESTRIAN, now at the bottom of the Mediterranean, a victim of a German torpedo. Some time ago, the board decided that the shelter decks of all vessels at this port be included in the admeasurement of tonnage, but the owners of CESTRIAN appealed from the ruling. The federal authorities decided in favor of the vessel, but the board insisted on the payment of the additional charge, and the owners of the ship carried the case to the United States district court, where decision again was given in favor of the vessel. Then the board appealed to the United States circuit court, which decided against the vessel, and now the federal supreme court has refused to review the case, so that the decision in favor of the dock board becomes final, and the owners of the CESTRIAN, though she has been eliminated from the seas, will have to pay the extra charges caused by the erection of shelter decks on their vessel. It is expected that every gulf port will adopt a similar ruling.

* * *

Old days on the Mississippi were revived when the AMERICA, a steamer from up the river, arrived in New Orleans with her decks awash from the weight of 2750 bales of cotton and 3240 bags of rice, the largest cargo brought to that port by any river steamer in a decade. AMERICA is the last of the old river steamers and small compared to those which at one time brought as high as 9000 bales of cotton each into New Orleans.

* * *

SPRAGUE, largest towing steamer in the world, has reached New Orleans with 10 steel barges of general cargo from St. Louis, which port she left Nov. 5. Each barge carries 1000 tons of freight. If the venture is a success a regular barge line will be established between St. Louis, Memphis and New Orleans. SPRAGUE belongs to the Memphis Barge Line, affiliated with the American Aluminum Co., St. Louis.

* * *

American schooner EL GALLO, from Gulfport to Tampico, Mexico, with gen-

eral cargo, was wrecked on the Tampico breakwater late in October. All the crew was saved, but the schooner was reported lost. Capt. Charles S. Loman was in command.

* * *

Steamer OLYMPIC, valued at \$450,000, with cargo worth \$250,000, was lost in a storm, 60 miles off the coast of Frontera, Mexico, late in October. OLYMPIC belonged to the Mexican Fruit Steamship Co.

* * *

The auxiliary schooner FLECHAS, 165 feet long, 36 feet beam and 13 feet depth of hold, with deadweight tonnage of 500, was launched from the ways of the M. M. Flechas shipyard, Krebs lake, near Pascagoula, Miss., Oct. 19. FLECHAS will be used to carry lumber to Latin America, her capacity being 450,000 feet.

* * *

The Southern Pine association has submitted plans to the federal government for immediate public statements of all sales of lumber, whether to the government or to private parties. This sales report is to be distinctive from the market report and is intended to show the actual prices at which lumber is sold by this organization until the end of the war.

* * *

Crew of the Standard Oil Co. tank barge, No. 88, suffered three days without food or water, when the barge broke the hawser by which she was being towed by the tug OCEONE, out of Southwest Pass, Tex. The barge carried 30,000 barrels of oil, valued at more than \$400,000, and was eventually picked up by a Danish steamer and towed until picked up by the Standard company's steamer VESTA.

* * *

The board of commissioners of New Orleans has bought half a square of ground on the riverfront and will erect municipal warehouses for storage of coffee, rice and sugar.

* * *

Work on the widening of the section of the intercoastal canal from the Calcasieu to the Sabine rivers, from 40 to 100 feet, and deepening from 5 to 9 feet, will be started immediately, according to Col. J. S. Sanford, district engineer for the southern division of the canal, who is in New Orleans. The reconstructed canal will be 22 miles long, and, in addition to giving cheap and easy water transportation to a large farming district, will give the Lake Charles shipyards a clear outlet to the sea. The Calcasieu navigation board has sold \$260,000 worth of bonds for the work.

* * *

The Gulf, Mobile & Northern railroad is planning extensive terminal improvements at Choctaw Point, Mobile harbor.

* * *

The Mississippi River Improvement association has appealed to the shipping board to build for sale or lease on the installment plan, a large fleet of barges for use on the Mississippi river to relieve the car shortage of the railroads. Establishment of a line of light draft barges, drawn by powerful towboats, such as operate on the Rhine, was urged as a necessity, to enable the Mississippi river and valley to share in the transportation burden during the war, and to aid inland manufacturers and shippers afterward.

Red Hot Tips From the Trade

Pertinent Suggestions and Personal Gossip

HOW gas may be used in heating furnaces or for other uses around shipyards is pointed out in a recent booklet issued by the Selas Co., New York. After discussing the advantages of gas as a fuel, the booklet describes in detail the system which this company has developed. The system is said to be adaptable for all industries where heat-treatment is employed. It is said to be extremely elastic and applicable to every industrial heating purpose.

The apparatus consists of four parts: A pressure reducing valve which reduces to atmospheric pressure the gas which may enter at varying pressures from the city mains; a mixing chamber in which the gas and air are admitted in the proper proportions; a compressor by means of which the mixture is delivered under pressure through the service mains to the burners; a pressure governor which controls the delivery pressure, at the same time acting as a by-pass for any quantity of air and gas mixed by the apparatus in excess of the demand at any period.

The apparatus is said to be compact, the system being the one-pipe type. The apparatus is designed automatically and mechanically to mix gas and air in definite proportions and to distribute this mixture under uniform pressure through the service mains to the burners. This, it is claimed, not only eliminates the human element in obtaining the correct mixture, but precludes any waste of gas. The system has been installed at various yards including that of the Hanlon Shipbuilding & Dry Dock Co., Oakland, Cal.

Grating for Ships

A grating designed for machinery hatchways in ships, power house floors, galleries and walkways, pump platforms, turbine pits, stair treads, etc., is being manufactured by the Irving Iron Works Co., Long Island City, N. Y. A feature in the construction of this grating is the truss element, which it is claimed not only adds to its rigidity but allows for full distribution of all loads. The grating is said to be nonslipping and noiseless. Wheels can be rolled across it in any direction without going through and spreading the bars. The mesh, although sufficient for ample ventilation and light, prevents ordinary tools from falling through.

This grating is manufactured in several different types, varying in weight and in the size of the mesh. A number of these gratings are in use at U. S. navy yards and on merchant steamers. A catalog, recently issued by the Irving company, describes the grating in detail and contains a number of attractive illustrations. Results of tests also are given.

Woodworking Machinery

Equipment for use in wooden-ship yards is described at considerable length in a series of catalogs issued by the Lane Mfg. Co., Montpelier, Vt. The various catalogs describe and illustrate in detail woodworking machinery, circular saw mills, dogging devices, saw mill feeds and buffers, lumber and timber edgers, planers, matchers and jointers, cutting-off machines, trimmers, etc. The company builds a complete line of machinery necessary for the manufacture of lumber. The catalogs will be found to contain complete descriptions of all the machinery and devices manufactured by this company.

Reverse Gear

The Carlyle Johnson Machine Co., Manchester, Conn., has issued an illustrated circular describing its alloy-steel marine reverse gear and friction clutch. The apparatus consists of a nest of spur gears incorporated in a gear cage on each end of which clutch members are mounted. The gears are always in mesh with the shaft pinions. Expanding friction rings are mounted on each end of the gear cage and are manipulated by toggle levels. The leverage is so compounded that it requires but little pressure to operate the clutches. Double-row ball bearings support the main drive-shaft at each end of the gear cage. The propeller end is provided with a double thrust bearing.

Fred M. Harmon has become associated with the Cleveland Alloys Co., Cleveland. He will handle the company's babbitt products exclusively for the marine trade of the Great Lakes.

Shipbuilding is a thriving industry at Beaumont, Tex., and the city was never as prosperous as at present. There are now six shipbuilding yards, with 14 vessels being constructed, and

preparations are being made to construct two yards for building steel ships. Contracts for a total of 64 wooden vessels have been closed. The lumber for these ships is being obtained direct from the mills at Beaumont.

Rivet Cutting Gun

The Rivet Cutting Gun Co., Cincinnati, describes its apparatus for cutting rivets in an attractive booklet recently issued. This gun is now being used in various shipbuilding and ship repair yards, boiler shops and on repair work on ships at sea. The gun cuts off the rivets cold. The booklet is freely illustrated with a number of photographs showing the wide variety of uses to which the gun has been adapted.

Describes Marine Engines

A bulletin is being distributed by the Wolverine Motor Works, Bridgeport, Conn., describing its line of marine engines. Special attention is called to its heavy duty marine engine which is of the 4-cycle, multi-cylinder type. The company's engines are built in sizes from 5 to 200 brake horsepower. They are designed to operate on a variety of fuels, including kerosene, alcohol, distillate, gasoline and other oils. The bulletin contains a number of interesting illustrations, one showing a 165-foot submarine tender equipped with a 200-horsepower kerosene engine.

W. H. Bramman is now connected with the Walter A. Zelnicker Supply Co., St. Louis, in the capacity of assistant to the president. Mr. Bramman formerly was affiliated with the American Carbon & Battery Co.

The Biddeford Shipbuilding Co., Biddeford, Me., was organized in October, with \$100,000 capital by Ernest L. Morrill, president; Edward M. Deering, treasurer; the officers and George F. Swaney, Jere G. Shaw, George P. Fogg, Arthur L. Roberts, W. J. Gilpatrick, William Gould and Cecil F. Clark, directors. The work of fitting up a shipyard on the banks of the Saco river will begin at once.

Equipment Used Afloat and Ashore

Boiler Cleaner—Plate Punch Table—Blow-Off Valves—Electric Hoists

A CLEANER designed to prevent the accumulation of mud and other impurities in a boiler is described in detail in a bulletin just issued by the Detroit River Iron Works, Detroit. The cleaner, as shown in the accompanying illustration, consists essentially of a multiport valve chamber, which is constructed of cast

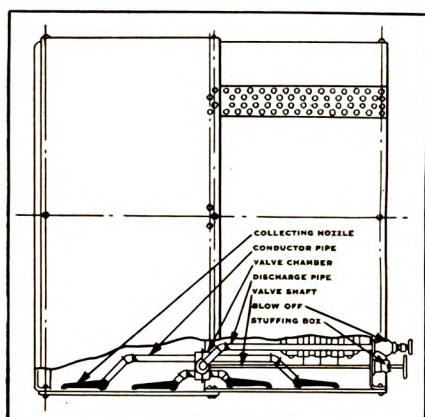


DIAGRAM OF BOILER CLEANER

iron. To this valve chamber is connected a number of conducting pipes terminating at their opposite ends in dirt-collecting nozzles which rest on lugs and leave an opening adjacent to the boiler shell.

The valve chamber is connected to a discharge pipe, which in turn connects with the main blow-off pipe on the boiler. Fitted in the valve chamber are a pair of selective valves, which are operated by a valve shaft that extends through a stuffing box in the boiler head. The function of the selective valves is to open and close the different ports separately, so that all of the pressure in the boiler may be employed to force the sediment into the collecting nozzle in communication with the valve chamber. The operator is able to ascertain which nozzle is in communication with the valve chamber as the gland of the stuffing box is graduated and the valve shaft is provided with a pointer.

The method of operating the cleaner may be described briefly as follows: The main blow-off valve is opened and the valve shaft turned until the pointer is even with the graduation on the stuffing box gland. This opens communication between one of the collecting nozzles, through the valve and valve chamber, and then overboard through the blow-off. The pressure on the boiler and the shape of the collecting nozzle are said to produce a violent sweeping effect

around the nozzle. When all sediment in one particular location has been collected, the valve shaft is moved until the pointer is in line with the next graduation on the stuffing box gland. In this way a complete revolution of the valve is made and it is claimed that the entire bottom of the boiler is swept and cleaned. It is said that the time required to clean a Scotch boiler rarely exceeds $1\frac{1}{2}$ minute.

New Plate Punch Table

A plate punch table designed for punching steel plates easily and quickly is being manufactured by the Norbom Engineering Co., Philadelphia. Two sizes are manufactured, one to handle plates up to 25 feet in length and the other up to 30 feet in length. The machine, it is claimed, is adaptable for use with any type of punch, the only necessary requirement being that the punch is fitted with a floating type of punch proper.

This machine, which is shown in the accompanying illustration, is operated by one man. After a plate is laid on the table, the operator places the plate in position by use of two levers, of which one

to his right controls the movement of the table backward and forward and one to his left, the movement sidewise. The punch is then tripped. This may be done also by use of a foot pedal. It is said that this machine can handle plates from $\frac{1}{4}$ inch to 1 inch in thickness and up to 8 feet in width and at least 25 feet in length. Roller bearings facilitate the operation of the punch table.

Among the shipbuilding companies now using from two to 14 of these machines are the Bethlehem Shipbuilding Corp., the Pennsylvania Shipbuilding Co., the New Jersey Shipbuilding Co., the Pusey & Jones Co., the Sun Shipbuilding Co., the Federal Shipbuilding Co., the Groton Iron Works, and the Baltimore Drydocks & Shipbuilding Co.

Carlton Wilby, a naval architect with a large experience in designing and building fine yachts, passenger steamers and bulk freighters on the Great Lakes, has been called to the service of the government. He will be attached to the Cleveland office of the United States Shipping Board Emergency Fleet corporation where he will work under the direction of Henry Penton, district officer. It is understood Mr. Wilby's duties will be those of inspector of

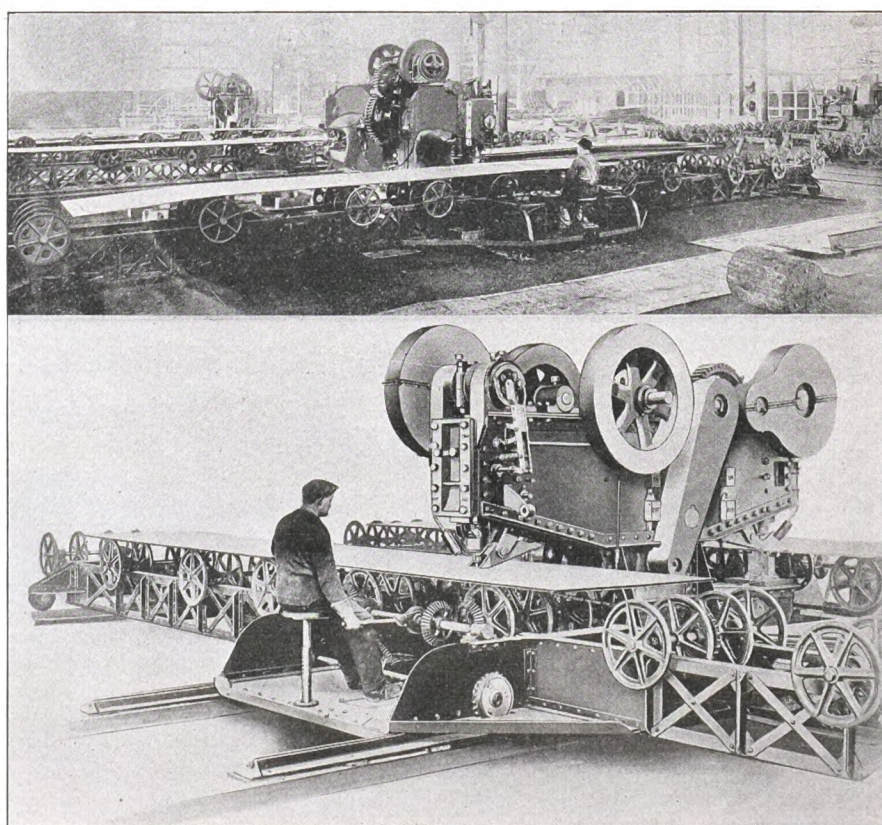


PLATE PUNCH TABLE

equipment. He is especially fitted for this position in view of his wide general experience as a naval architect obtained in private practice and through his recent association with the Great Lakes Engineering Works, Detroit.

Designs Valve for Marine Boilers

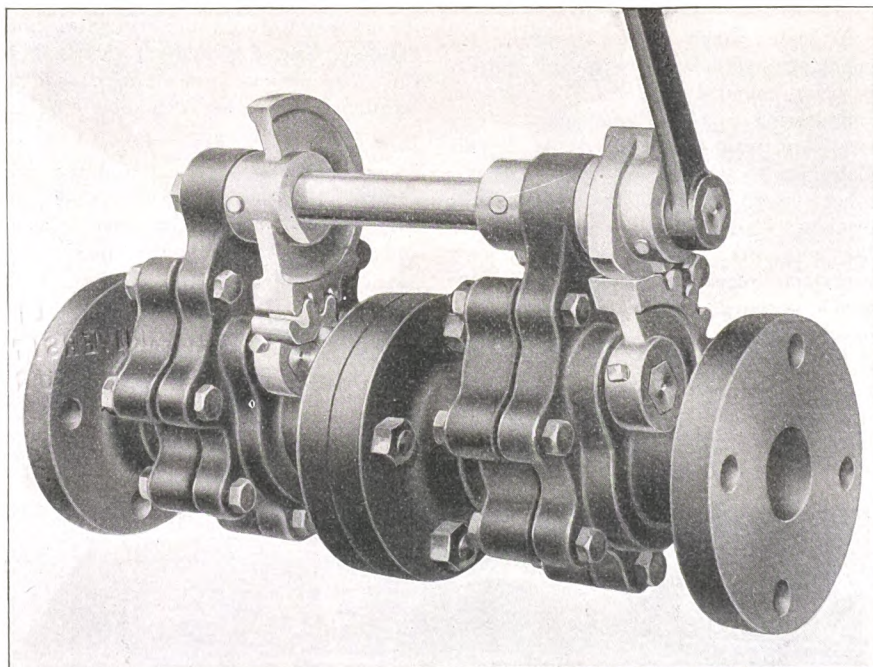
A valve which is designed to do away automatically with leaks resulting from the blowing-off of a boiler has been brought out by the Everlasting Valve Co., New York City, and now is being handled by the Scully Steel & Iron Co., Chicago.

Blowing-off is generally done by operating separately two different and

The lever is pulled back as far as it will go—generally about one-half turn. This causes the valve next to the boiler to open full, while the other valve is still closed. After the first valve is fully open, it is locked open while the slower operation of the second valve is taking place. The boiler then blows off. All this is done by one motion of the lever.

After the boiler has blown off, the lever is pushed back to its original position. This results in the valve farthest from the boiler closing, while the other valve remains locked open, until the valve farthest from the boiler is closed. The nearest valve then closes.

The entire procedure of blowing-off a boiler is thus designed to be ac-



NEW VALVE FOR MARINE BOILERS

distinct valves, one the quick-opening valve nearest the boiler and the other the slow-opening valve. This procedure sometimes involves considerable trouble if the operator is indifferent and regards part of the work as unnecessary. As a result, in many instances, one of the valves is left open all the time and the blowing-off of a boiler is done by opening and closing the other valve which, under these circumstances, may soon begin to leak. When the valve leaks it is left open all the time and the other valve used until it also leaks. This leaky condition naturally costs money while operating and results in the additional expense of closing down the boiler and making repairs.

This new type of valve is designed to operate automatically both valves by a hand lever. The cycle of operations of this type of valve is as follows:

complished by two shifts of the lever, in order to simplify the operation.

Resumes Manufacture of Hoists

The Link-Belt Co., Chicago, recently announced its intention of resuming the manufacture of electric hoists and will specialize in hoists ranging in capacity from 1000 to 6000 pounds. These machines, which will be manufactured at its Philadelphia plant, can be adapted for either direct or alternating current and are fitted with plain, hand-gear, cord-operated motor, or a cage-operated motor trolley. Fig. 1 shows a direct current, plain trolley hoist handling boiler cores in a foundry before the cores have been baked.

The hoist employs a dynamic braking system in which the descending load

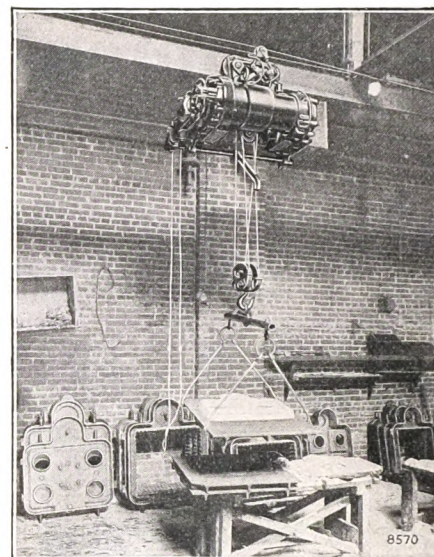


FIG. 1—ELECTRIC HOIST HANDLING CORES IN A FOUNDRY

drives the hoisting motor as a generator and uses it for a brake. This type of brake permits work of a delicate nature such as the lowering of cores, to be handled with comparatively little danger of breakage from sudden shocks. All parts of the hoist are enclosed but they can readily be made accessible. By removing a sheet steel cover, the hoisting drum and controller may be reached and by removing the heads of the end housings the spur gears are exposed and may be slipped off the shafts. The cut steel gears run in oil and automatically splash lubricate the bearings. Fig. 2 illustrates a hoist handling a large pulley in a manufacturing plant.

The Canada Steamship Lines, Ltd., 9 Victoria square, Montreal, plans to build a shipyard at Cap de Madeleine, Que.

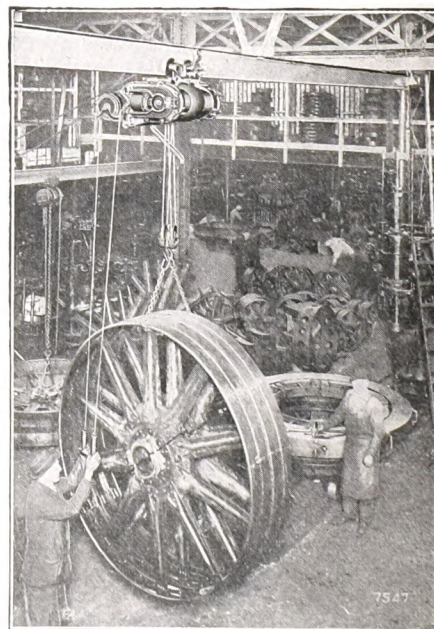


FIG. 2—HOIST HANDLING A LARGE PULLEY IN AN ERECTING SHOP

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CLEVELAND

DECEMBER, 1917

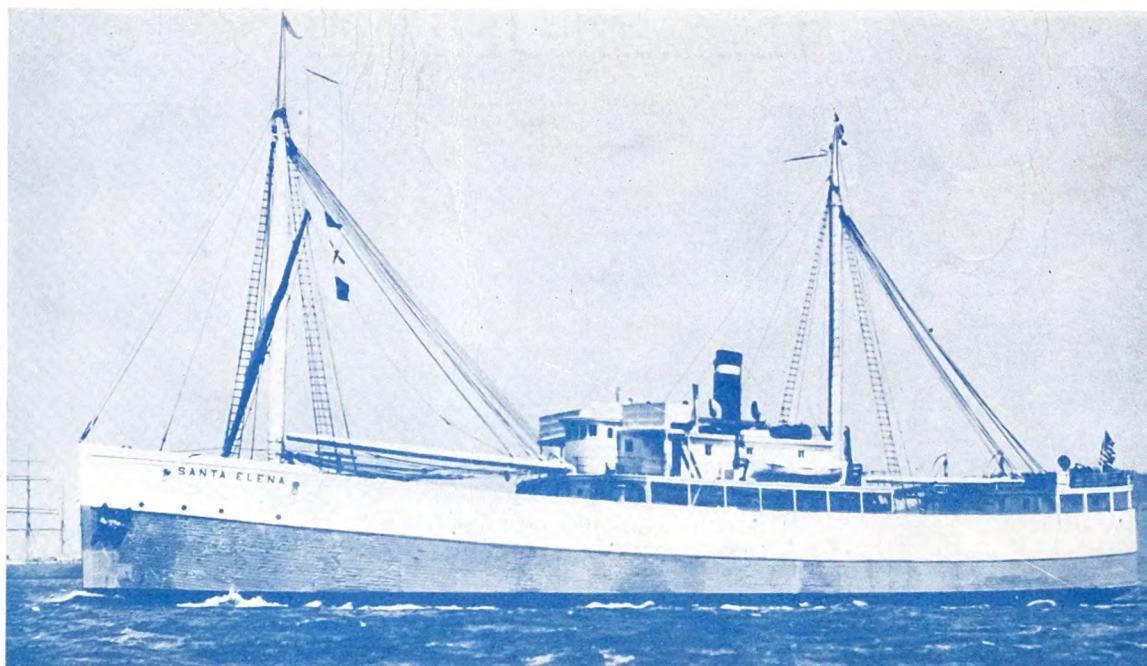
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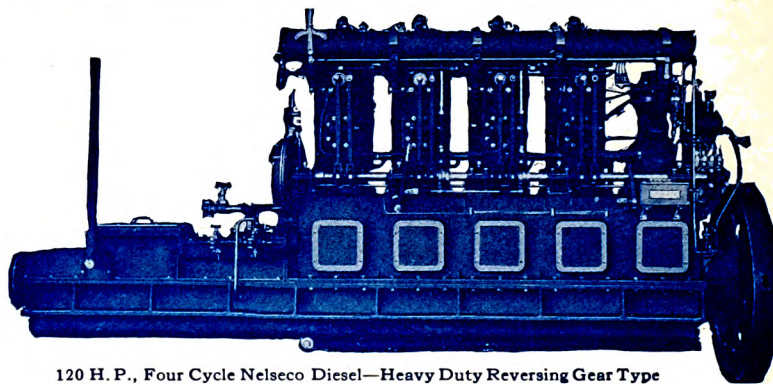
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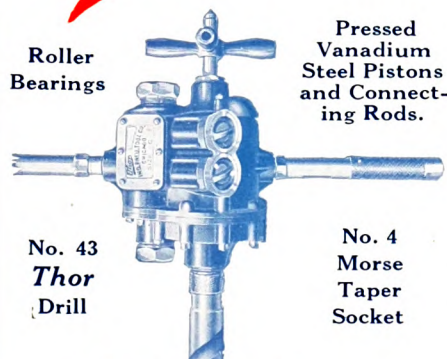
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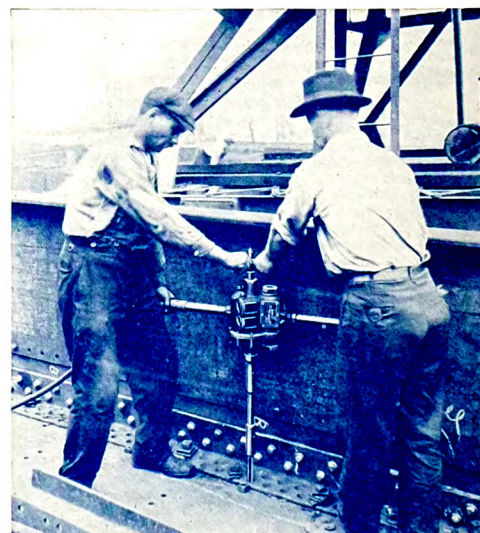
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No matter what kind of ships you are building you will require additional Pneumatic Tools.

You naturally want air tools that will give constant service with the least possible delay and expense for repairs—Tools that will speed up production and decrease operating expenses.

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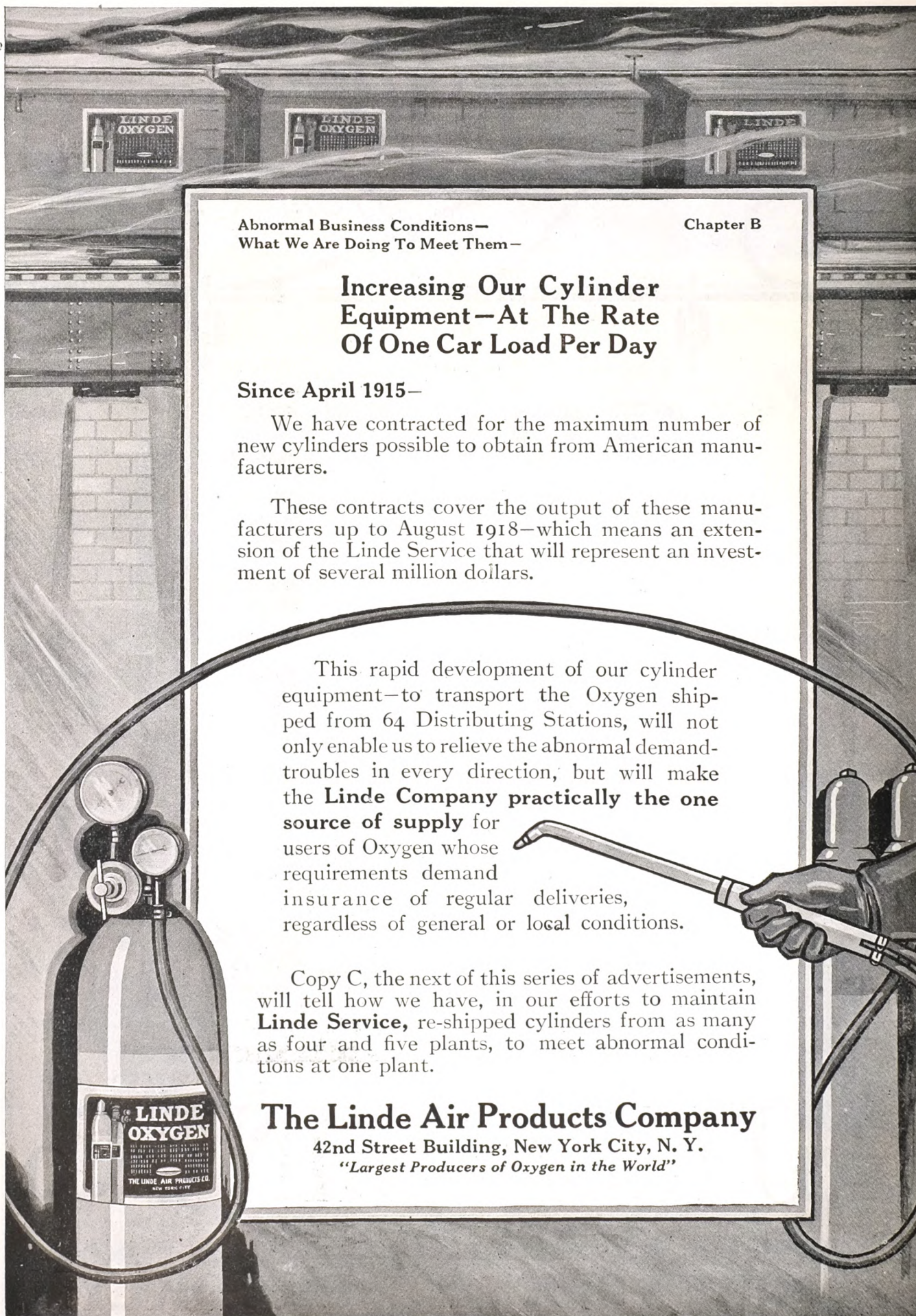
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Abnormal Business Conditions—
What We Are Doing To Meet Them—

Chapter B

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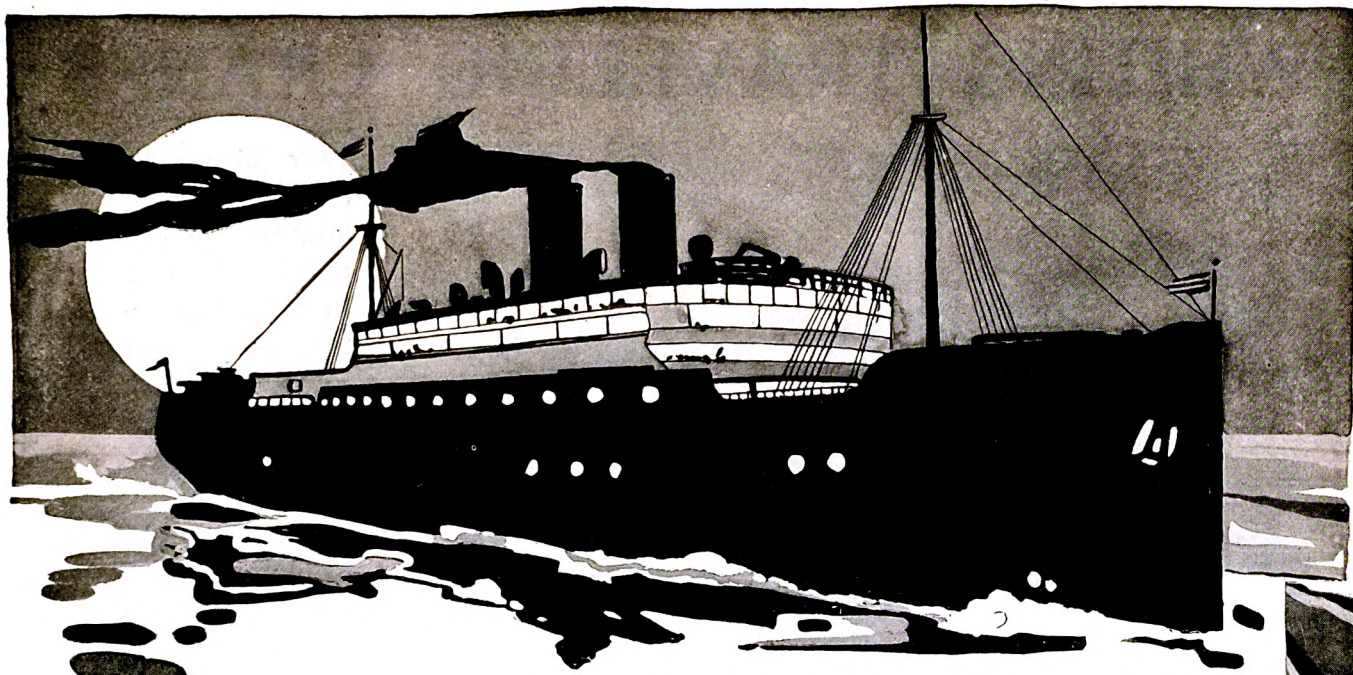
These contracts cover the output of these manufacturers up to August 1918—which means an extension of the Linde Service that will represent an investment of several million dollars.

This rapid development of our cylinder equipment—to transport the Oxygen shipped from 64 Distributing Stations, will not only enable us to relieve the abnormal demand-troubles in every direction, but will make the **Linde Company practically the one source of supply** for users of Oxygen whose requirements demand insurance of regular deliveries, regardless of general or local conditions.

Copy C, the next of this series of advertisements, will tell how we have, in our efforts to maintain **Linde Service**, re-shipped cylinders from as many as four and five plants, to meet abnormal conditions at one plant.

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CLEVELAND—NEW YORK, DECEMBER, 1917

THE MARINE REVIEW

A Monthly Publication Devoted to Shipbuilding, Marine Engineering and the
Business of Transportation by Water.

Published by The Penton Publishing Co., Cleveland, Ohio, U. S. A.

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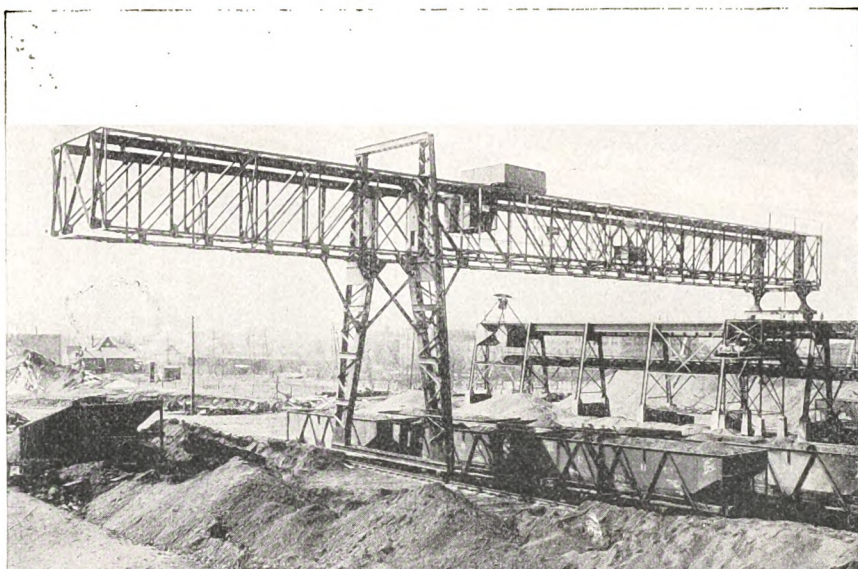
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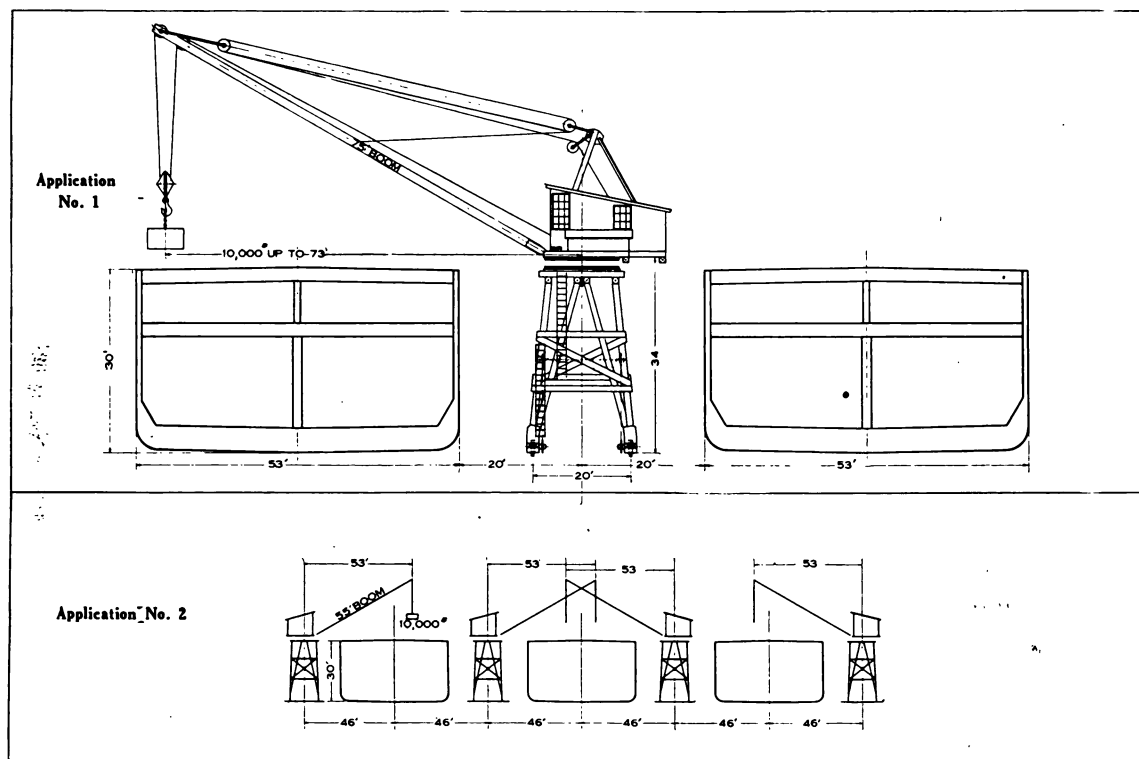
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The illustrations show the application of TOWER WHIRLERS to Ways building standard Shipping Board 7300 ton steamers, described on pages 349-357 of Marine Review, October 1917 issue.

The WHIRLER shown by Application No. 1 serves two Ways. It has a Boom 75 ft. long and will handle 10,000 pounds at a radius of 73 ft. hoisting this load at the rate of 150 ft. per minute.

Application No. 2 shows three Ways served by four TOWER WHIRLERS having Booms 55 ft. long.

Booms can be rotated through 360 degrees.

WHIRLERS travel at the rate of 300 ft. per minute.

The height of the Tower is such that the operator can see the load at all times.

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Our Engineering Department is at your Service.

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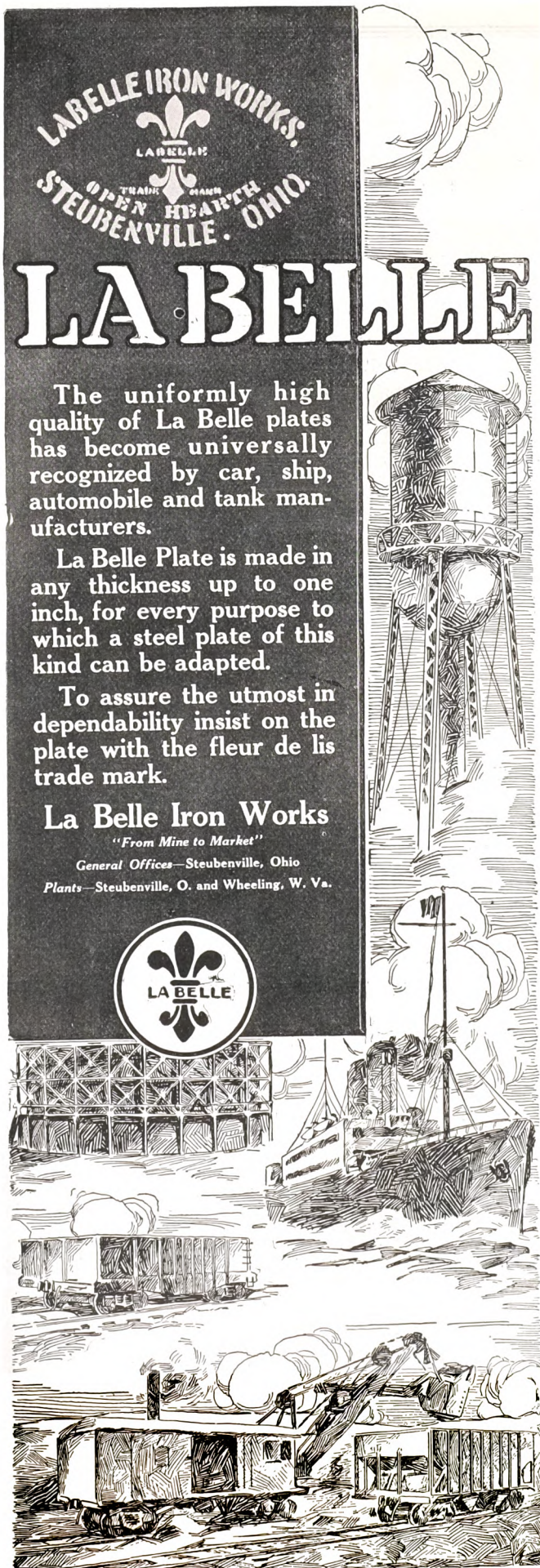
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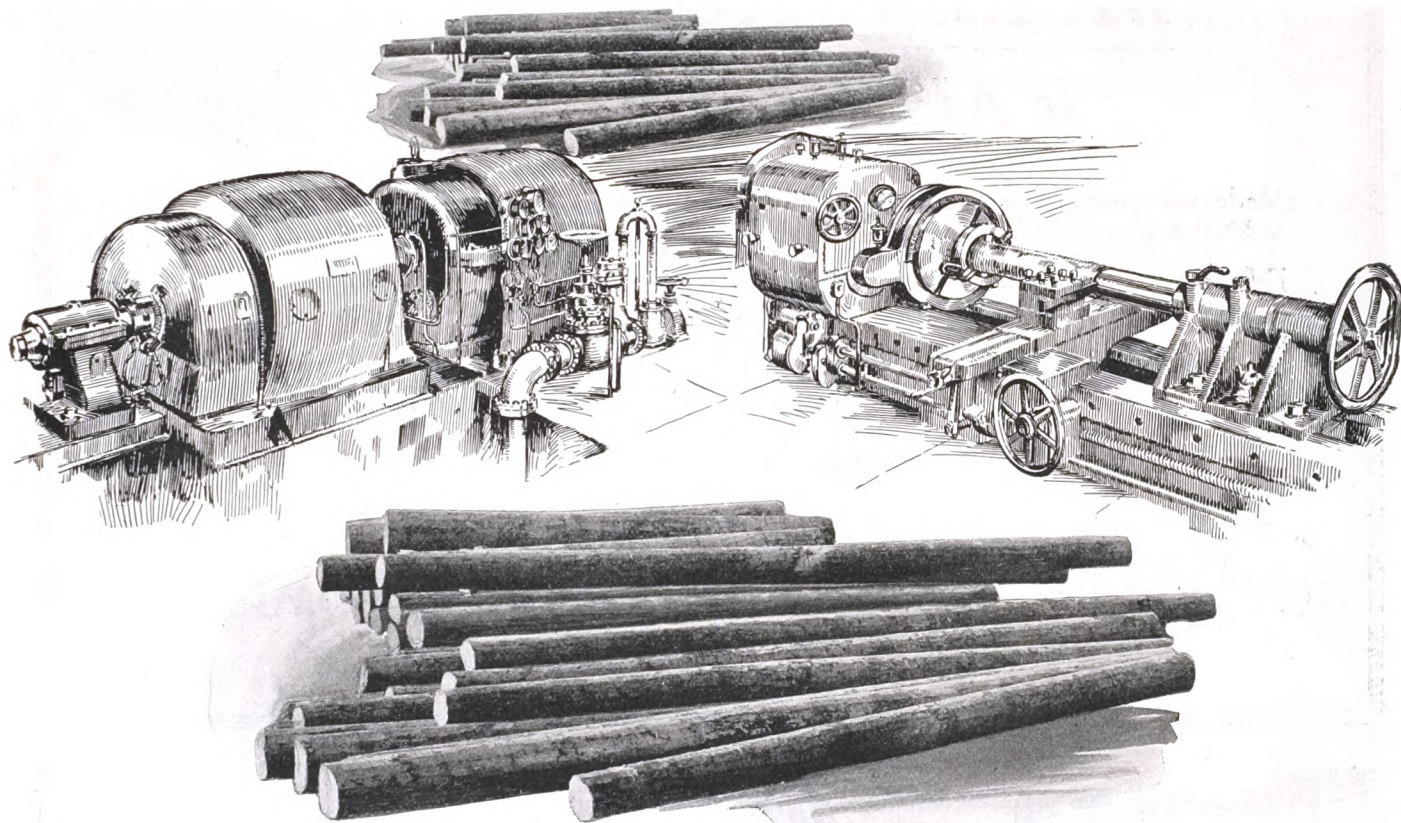
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to buy our smooth forged round bars, 4" and up in diameter, put them in a Lathe and directly turn your own Armature, Motor, Turbine and other shafts. Nothing better, quicker or cheaper, **And Remember**

CAMDEN FORGINGS

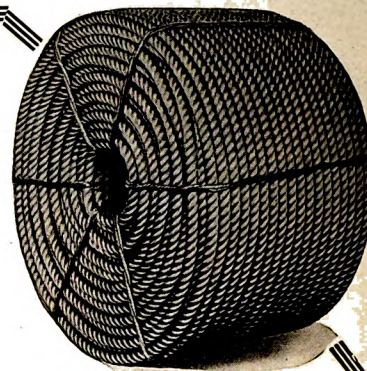
are made for all classes of the trade, for Ships, Engines, Machine Tools and so on. **Again Remember**, that each year sees our plant grow larger and larger in both tonnage shipments and in the weight of any one piece manufactured. **So Remember**, to send us your forging inquiries.

CAMDEN FORGE CO.
Bulson Ave., CAMDEN, N.J.

Please mention THE MARINE REVIEW when writing to Advertisers

WHITLOCK Manila Rope

Is ALL-Manila



Made with exceptional care and of high grade Manila Hemp exclusively, WHITLOCK MANILA is essentially a quality product, and as such is preferred generally for Marine work.

Different climatic conditions or changes in temperature, wind or weather, do not readily affect it. Being *All-Manila*, it offers maximum resistance to the action of salt water.

Possessing unusual strength, WHITLOCK MANILA is a safe rope, dependable in service and extremely long-lived. The Whitlock Trademark is your assurance of the highest possible standard of rope excellence.

Look for it!

Interesting printed matter on request.

Department B



WHITLOCK CORDAGE COMPANY
46 South Street, New York



The Mark Union is made from the same material that the piping is made from—wrought steel—therefore expands and contracts in the same ratio.

The Mark Union will withstand the corrosive action of sea water and salt air, all parts including the threads being protected by a rust-proof coating.

Guard your pipes from leaks and breaks—specify the Mark Union.

The Union is a small and unimportant part of a vessels equipment—*until it fails*, then it is a mighty important matter.

The severe vibration on board ship makes the broken or leaky pipe joint a frequent occurrence.

You can insure your vessel from all danger of leaky or broken pipe joints by using the Mark Union.

MARK MFG. CO.

1901 Dempster Street

EVANSTON, ILL.

Topping Brothers

52-54 WARREN STREET

NEW YORK

Immediate Shipment From Stock

of

General Supplies for Ship Construction

Ship Clamps

Deck Bolts

Planker & Cotton Jacks

Clinch Rings

Boat Spikes

Tackle Blocks

Chain

Chain Hoists

Treenails

Treenail Wedges

All Kinds of Tools

Railroad Spikes

Track Bolts

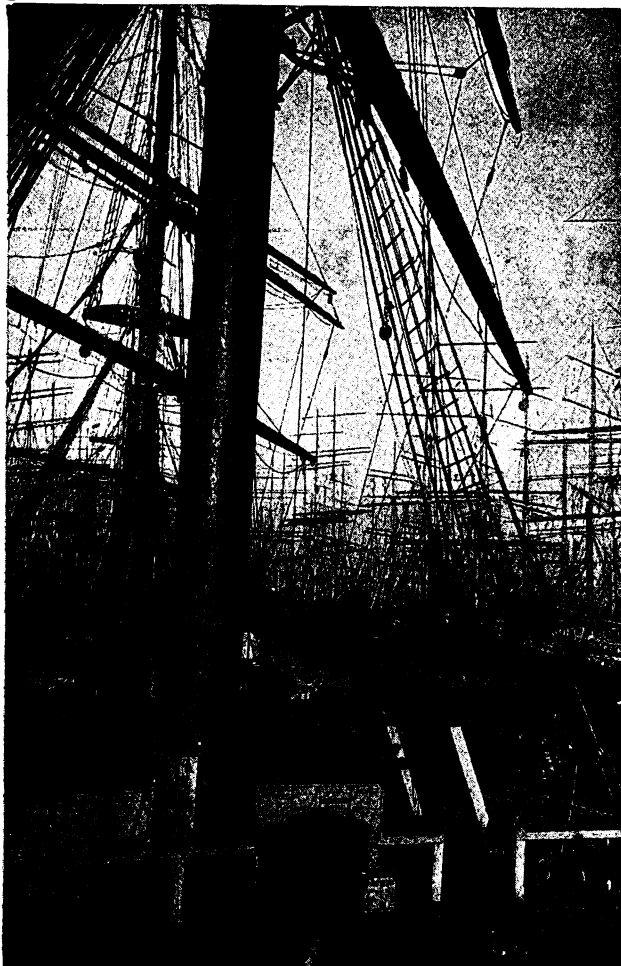
Caulking Tools

Shovels & Scoops

Bolts, Nuts, Rivets and Washers

Iron and Steel Bars, Shapes and Plates

WATERBURY CORDAGE



WHEREVER you see square riggers in numbers you may be sure that Waterbury Cordage and Waterbury Wire Rope play an important part in their equipment.

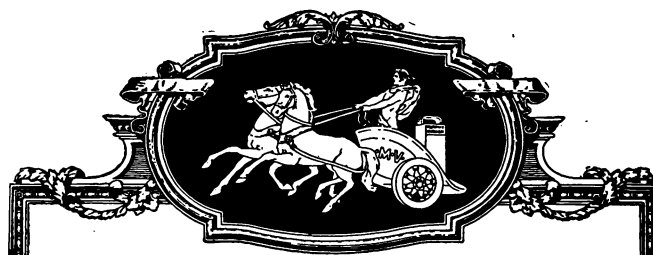
In fact in practically every branch of the marine industry the long and high standing of Waterbury products has moored the name of Waterbury so securely to quality equipment that it is hard to sail any of the seven seas any of the seven days of the week without seeing evidence everywhere of Waterbury superiority.

Pocket editions of our Cordage and Wire Rope Catalogs gladly sent on request.

WATERBURY COMPANY

63 PARK ROW, NEW YORK

CHICAGO	-	-	1315 W. Congress St.
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		Life Bldg.	
NEW ORLEANS	-	1018 Maison Blanche Bldg.,	Canal and
		Dauphine Sts.	
SAN FRANCISCO	-	-	151-161 Main St.
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Valiant Sea Fights

Every ship has its battle in the sea. Ships of Commerce and Ships of War constantly fight the elements of all sorts of weather; the bite of salt spray, sleet and snow; the strain of rough seas and the blistering heat of the sun on wet deck and spar. In this fight all the ship's guns are useless.

Murphy Transparent Spar Varnish

"the varnish that lasts longest"

is the durable weather-proof coat that protects ship surfaces, whether of wood or metal. It renders them smooth and cleanable and preserves and beautifies them.

For over half a century Murphy Spar Varnish has gone to sea insuring all kinds of craft against the destructive action of water, wind and wear.

It is the varnish that sailors salute.

Write for "Beautiful Boats and How to Care for Them". A book of sea sense and colored water colors of ships and shipping.

Murphy Varnish Company

Franklin Murphy, jr., President

Newark

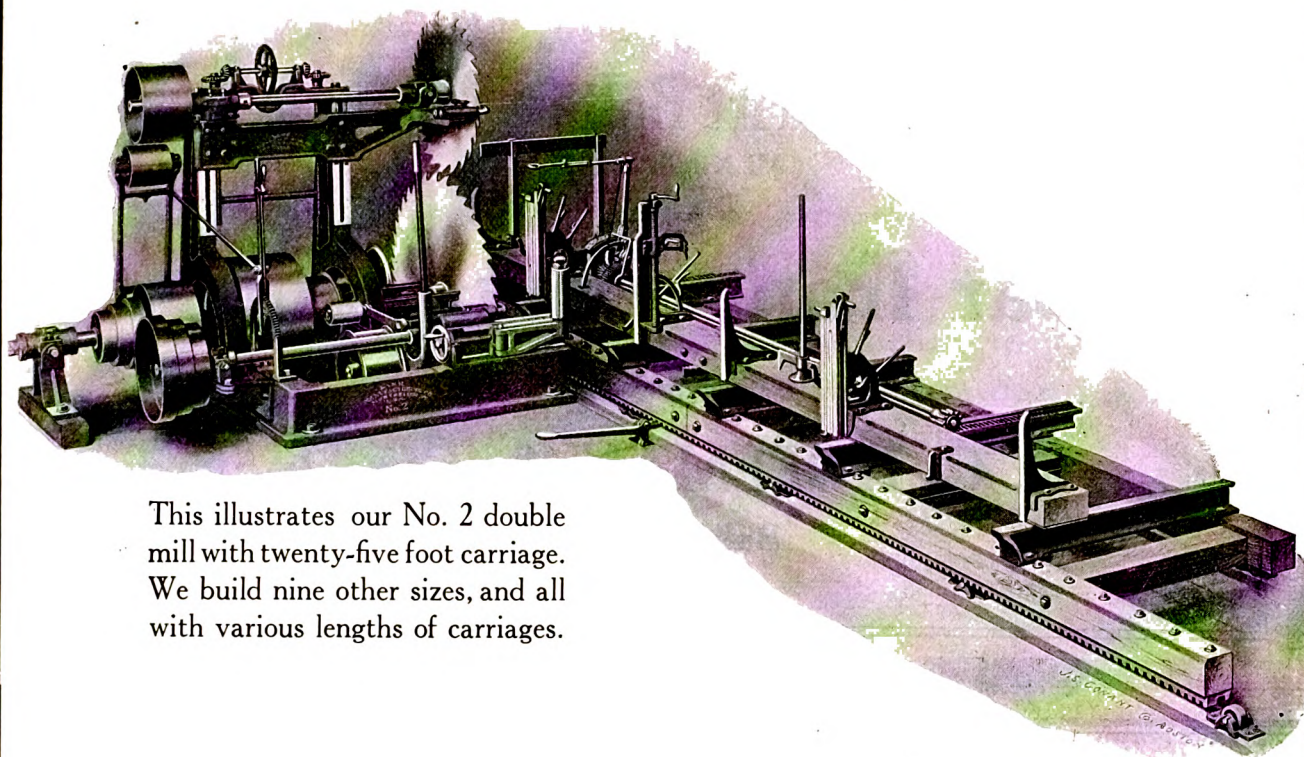
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Dougall Varnish Company, Ltd., Montreal, Canadian Associate

A. N. A.

LANE SAW MILLS

are best adapted to the variety of work in shipbuilding plants.



This illustrates our No. 2 double mill with twenty-five foot carriage. We build nine other sizes, and all with various lengths of carriages.

OUR MILLS have won over 20 Gold, Silver and Bronze Medals and many Diplomas. They do perfect work, and are fully guaranteed.

They are very light and strong, will stand hard service, and are as light as is safe and reliable.

OUR CATALOG sent on request contains—

All kinds of Circular Saw Mills for every variety of timber, size and length of logs, single or double, right or left hand; Set Works, Direct Acting Steam Feeds, Air Buffers, Offsets, Dogging Devices, Log Jackers, Canters and Niggers; Drag, Swing, Friction and Steam Feed Cut-off Saws; Live and Dead Rolls, Edgers, Trimmers, Lath and Shingle Machinery, Traveling Bed and Roll Feed Surfaces, Matching, Friction Clutch Couplings, Wood Rim Pulleys, Car Trucks, Clapboard Machinery, Power Transmission Machinery.

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Boat Spikes

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Deck Bolts Drift Bolts Machine Bolts

All Kinds and Sizes

Bar Iron Port Lights

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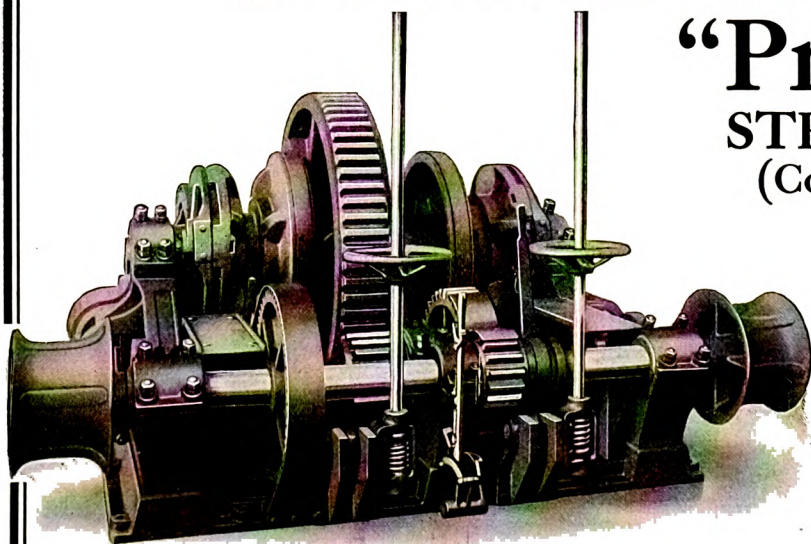
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Baltimore, Md.

General Office:
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"Having a PULL means having a friend in power who will act as a steam windlass for you." The

"Providence" STEAM WINDLASS (Compound Spur Gears)



has another kind of *pull*, and plenty of it. It has 15 per cent more *pull* than the worm-gear types and at 50 per cent faster speed. You have been looking for just this combination. Our price will please you, too.

Write us today.

AMERICAN ENGINEERING COMPANY

SUCCESSORS TO AMERICAN SHIP WINDLASS CO. AND WILLIAMSON BROS. CO.

MACHINISTS AND FOUNDERS

PHILADELPHIA

15-312

Are You Finding it *Hard to get Lumber?*



**LET US
FILL YOUR
REQUIREMENTS**

Why not buy it where you can get *quick service* as well as quality?

We represent the selling end for the combined output of ten companies, operating eighteen large mills.

These mills are all favorably located with both seaport and railroad facilities.

Keep up your working schedule by ordering your lumber from a firm that is fully prepared to fill your requirements for both quality and quantity.

Let us quote you on your next order for *North Carolina Pine*.

Southern Pine Sales Corporation

CHARLES HILL, General Sales Manager

Woolworth Building

New York City, N. Y.

Telephone 4966 Barclay

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Fosburgh Lumber Co., Norfolk, Va.
Atlantic Coast Lumber Corp., Georgetown, S. C.
A. C. Tuxbury Lumber Co., Charleston, S. C.
J. F. Prettyman & Sons, Summerville, S. C.

E. P. Burton Lumber Co., Charleston, S. C.
Marion County Lumber Corp., Marion, S. C.
Savannah River Sales Company, Savannah, Ga.
Montgomery Lumber Co., Spring Hope, N. C.
Winyah Lumber Co., Georgetown, S. C.



A Plunge in the Deep with Nothing to Fear

Absolute SAFETY and PROTECTION to sailors and travelers, in shipwrecks, collisions, fires and all other kinds of disaster on *water*, are afforded by

The Ever-Warm Safety-Suit

This *Real Life Preserver* is so constructed that any man, woman or child can step into it and plunge into the water, where they will float in an upright position, head and shoulders above the water

You Can't Drown! You Can't Chill!

Indispensable on the *Ocean* or on the *Great Lakes*. Here are a few of those who have tried it:

Chester Beecroft, motion picture exporter, says: "The ship on which I was traveling was torpedoed in the North Sea and I was in the water more than four hours, until rescued. The suit kept me dry and comparatively comfortable all the time. If it had not been for my Ever-Warm Safety-Suit, I likely would have shared the fate of many who were drowned."

Dr. George E. Brewer, head of the Presbyterian Hospital Unit, says: "I regard the Ever-Warm Safety-Suit as 90% life insurance. The nurses and doctors, ready to sacrifice their lives on the other side, are entitled to this protection."

An army officer, describing the ramming of his transport, tells of the feeling of security his party enjoyed, knowing that the Safety-Suit would protect them under all conditions.

Be prepared—whether you travel the *Ocean* or the *Lakes* you need *protection*—NOW—before it is too late! A one-piece garment, put on in less than a minute.

THE INTERNATIONAL LIFE SUIT CORPORATION

Sole Distributors of the

EVER-WARM SAFETY-SUIT

Telephone—Bowling Green 8609 10th Floor, 11 Broadway, New York City

Send today for complete illustrated Booklet, Price List and Order Guide

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Winter-Weather Protection for Boats and Equipment

Laying up time is at hand. Thousands upon thousands of canvas covers will be put into use. But the value of the service they render will be in direct proportion to their ability to repel moisture.

With the present canvas shortage, and with prices at their present high level, there will be a wide-spread endeavor to get at least another season's use from old canvas covers.

And the use of Preservo will make this possible. You can take old canvas covers, that are not too badly worn, treat them with Preservo and make them *absolutely waterproof*—and for protective purposes exactly as good as new canvas.

Where new, light-weight, close-weave canvas is used it can be treated with *Preservo* and made to give as good, or even better service than heavy untreated canvas.

Preservo is a chemical compound with a natural affinity for vegetable fibre. It is easily applied to canvas with a wide paint brush or white-wash brush.

It impregnates the fibres—seals up the pores, and makes the canvas absolutely watertight. In addition, Preservo also leaves the canvas soft and pliable—it *preserves* the fabric and greatly increases its wearing qualities.

There is a record of 17 years of successful service back of Preservo—it is known as the standard waterproofing in use on the waterways of America.

When you use or specify Preservo you are getting a product of *known* and *proven* quality.

Go to practically any ship chandler—or canvas dealer, and you can get complete details about liquid Preservo, or about Preserved canvas.

*For special literature address
our nearest office.*

Robeson Preservo Products Co.
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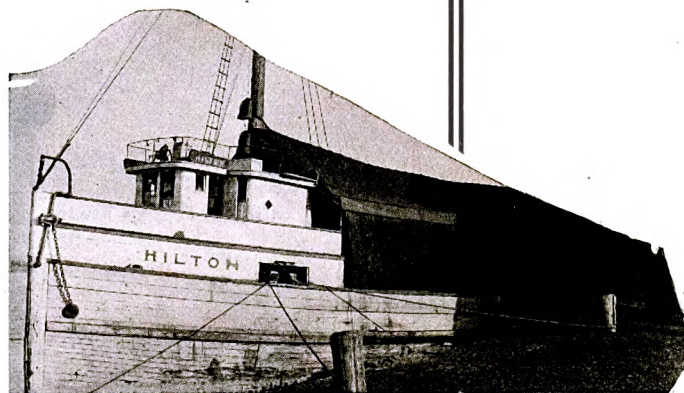
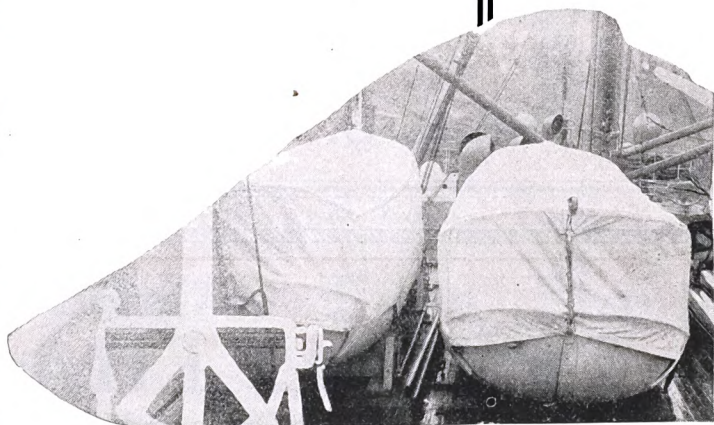
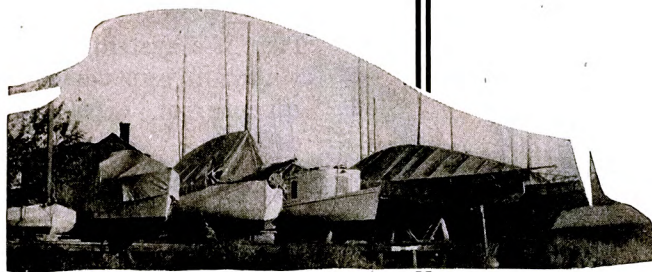
Eastern Branch:
357 Western Ave., Boston, Mass.

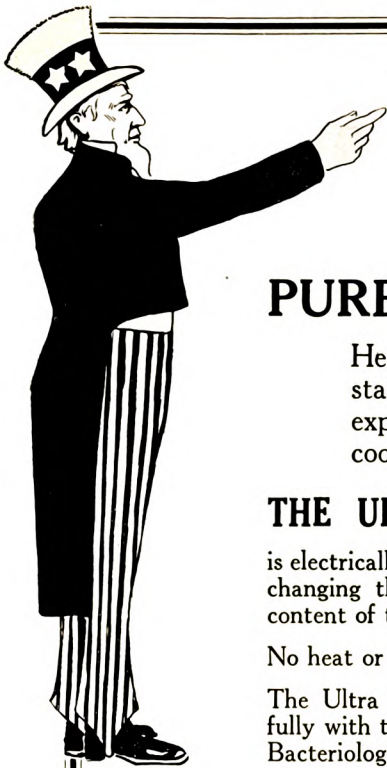
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Distributors for Pacific Coast

Preservo
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**Waterproofs and
Preserves Canvas**





Why Not Obey Your Uncle Sam's Orders?

install an Efficient **PURE WATER SYSTEM**

Here is a system that can be installed in your vessel without the expense of extra pumping or cooling.

THE ULTRA VIOLET RAY SYSTEM

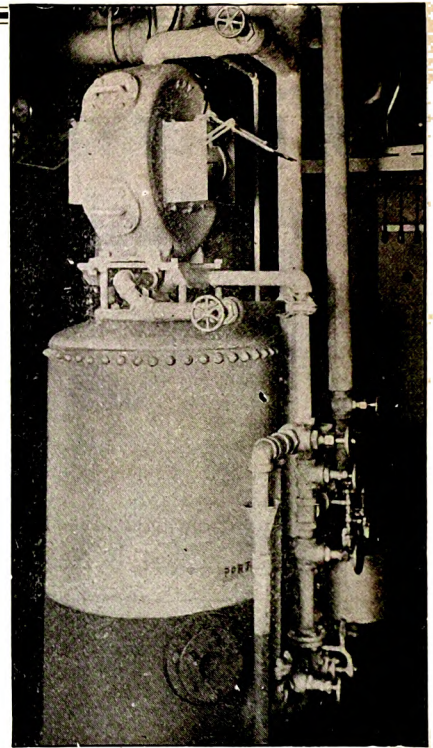
is electrically operated. It sterilizes and filters without changing the taste, odor, color, mineral or gaseous content of the water.

No heat or chemicals are required.

The Ultra Violet Ray Pure Water System complies fully with the latest U. S. Government requirements. Bacteriological results guaranteed.

Write at once for full particulars

THE R. U. V. COMPANY



Installation of STERILIZER and FILTER
on S. S. ALABAMA

50 BROAD STREET
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ESTABLISHED 1852

GEO. H. THACHER & CO.

Main Office and Works: ALBANY, N. Y.

10,000 lb. Mushroom Anchor

**Cleats
Chocks
Bitts
Double Bitts**



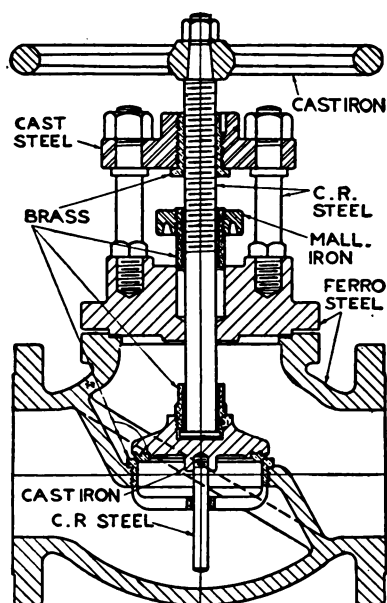
**Mushroom Anchors
Mooring Posts
Snubbing Posts
Spud Points**

Marine Specialties

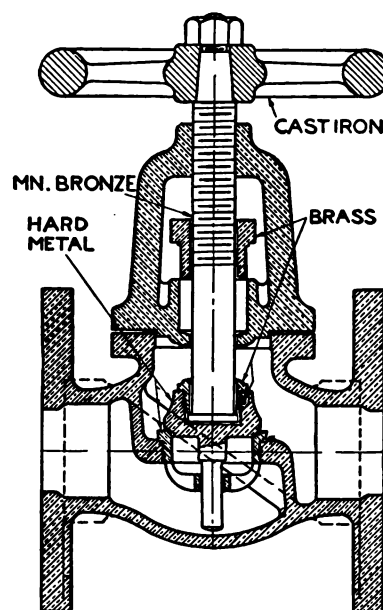
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Send us your requirements for

MARINE VALVES



No. 26E



No. 87E

Main Boiler Stops

Globe and Angle

Ferrosteel body and cover; Steel cross-heads; Cast Steel body and cover; Steel cross-heads; Stems of cold rolled steel, manganese bronze or monel metal.

All Brass Bolted Yoke

Boiler Feed Stops

Screw Down Checks;
Surface Blows;
Main Blow-Offs.

ALSO MAIN INJECTION VALVES, OVERBOARD CHECKS, GLOBE, ANGLE AND GATE VALVES, POP SAFETY VALVES, PRESSURE REGULATORS, WATER RELIEF VALVES, ETC.

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836 S. MICHIGAN AVE.

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STANDARD TYPE STEAMERS

SUN SHIPBUILDING CO.

BUILDERS OF
STANDARDIZED VESSELS

OF

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ENGINE BUILDERS
BOILER MAKERS

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CAPACITY - 12 VESSELS PER YEAR

PLANT:

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GENERAL OFFICES:

1428 So. Penn. Square, Philadelphia, Pa., U. S. A.

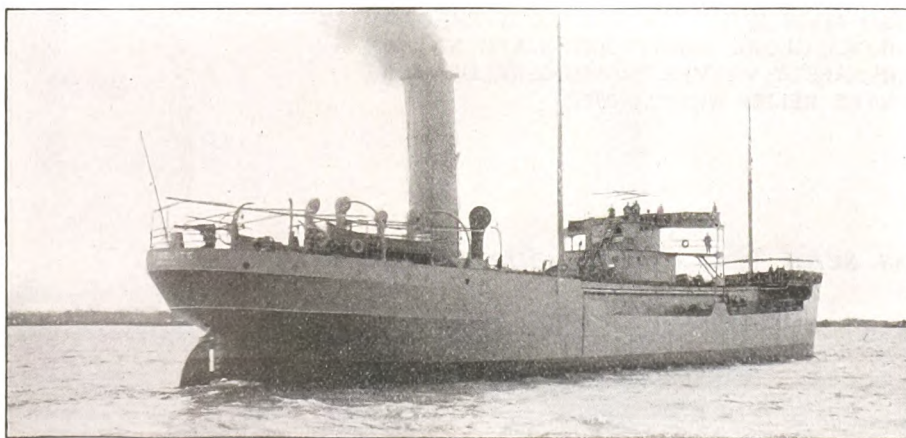
THE COLLINGWOOD SHIPBUILDING CO.

LIMITED

COLLINGWOOD—ONTARIO—CANADA

**STEEL and WOODEN SHIPS, ENGINES,
BOILERS, CASTINGS and FORGINGS**

PLANT FITTED WITH MODERN APPLIANCES FOR QUICK WORK



Steamer "REGINOLITE," one of the five ocean going oil tank steamers built for the Imperial Oil Company, Limited, Sarnia, the others being the S.S. "IOCOLITE", S.S. "SARNOLITE", S.S. "ROYALITE" and "TALAVALITE".

DRY DOCKS

and

SHOPS

EQUIPPED TO

OPERATE

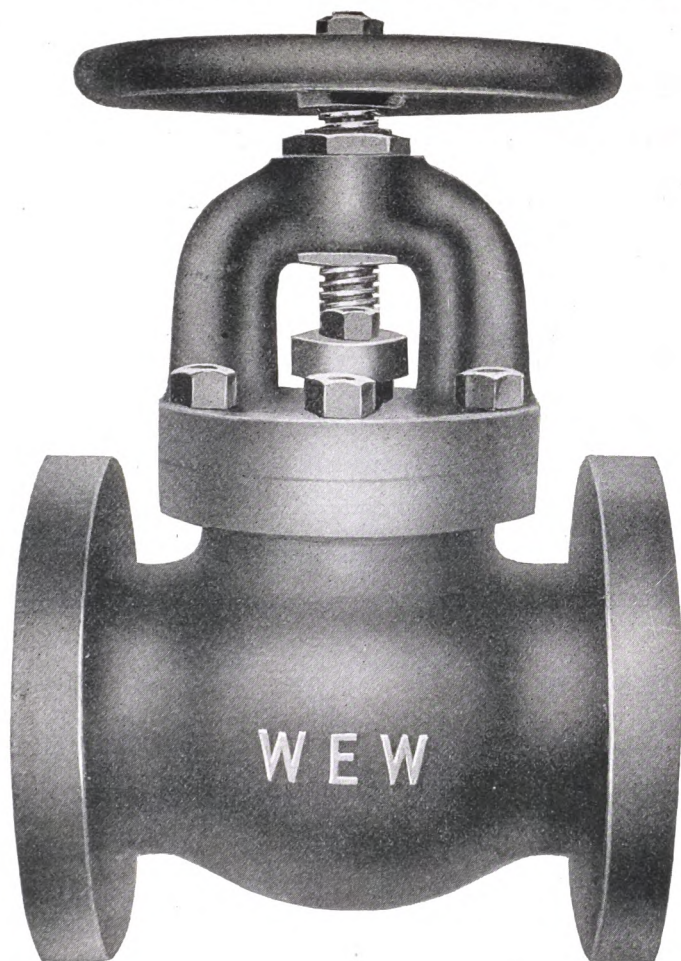
DAY or NIGHT

on

REPAIRS

“WEW” VALVES

are especially made for Marine Service, and
are thoroughly guaranteed in every respect



Cross Valves
Snifting Valves
Relief Valves
Throttle Valves
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Oil Cups
Grease Cups
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Water Gauges
Steam Gauges
and Steam Cocks

We carry a full line of Bronze and Iron Body Valves in stock. Send at once for our catalog which shows the most important and most used types of valves. If the valve you require is not shown, remember we make it.

The “WEW” is the heaviest and best valve made

Write us

WILLIAM E. WILLIAMS

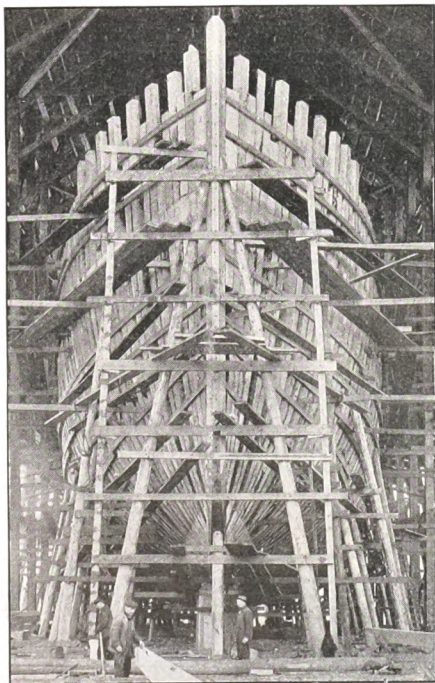
62 Front St., NEW YORK

Tugs

We can accept contracts for the immediate construction of wooden tugs.

By reason of the completion of all work for the Navy Department, inside building space is available in the largest and best equipped shops on the Great Lakes.

Great Lakes Boat Building Corporation
Milwaukee, Wis.



[Bow View of Framing of Ore Steamer "Anyox"
Vessel No. 142 at the Winslow Yard

Winslow Built Ships Have Stood the Test of Time—They Make Money for Their Owners, Continuously

With 90 acres of naturally sloping land and half a mile of frontage on deep, land locked harbor, eight miles from Seattle, our completely equipped plant offers special facilities for the construction of both wooden and steel vessels. Excellent labor conditions insure rapid and accurate work. Mild climate permits continuous operations out-of-doors throughout the year.

Modern Marine Railway With Steel Cradle 325 feet long—Capacity 4,000 Tons

The Winslow Marine Railway & Shipbuilding Co.

JAMES GRIFFITHS, President

Yards at Winslow, Washington

Main Office: Burke Building, Seattle, Washington

Admiral Sims, Commander, "OVER-THERE"
says:—

"Give us Destroyers!!"



REILLY EVAPORATORS

**will stand a 24-hour watch on every one
of these**

"Guardians of the Submarine Zone"



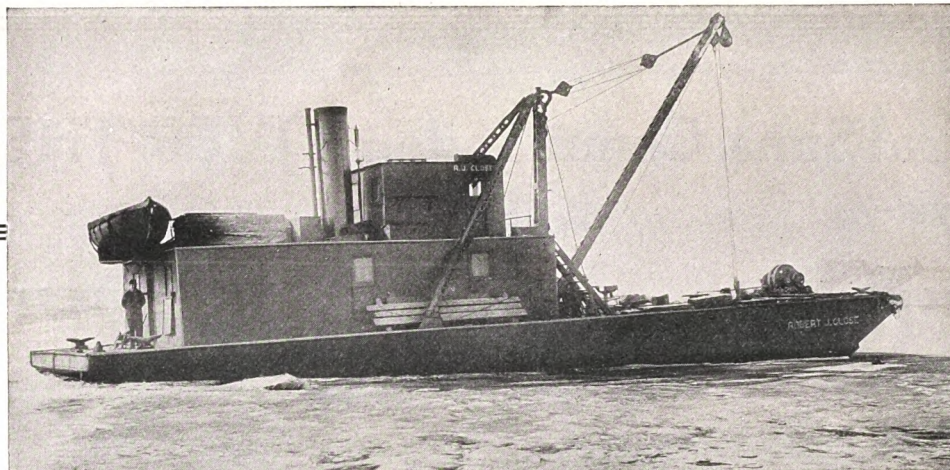
THE GRISCOM-RUSSELL CO.

2121 West Street Building

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NEW YORK

Chicago Office: 835-A MONADNOCK BUILDING



MARINE REPAIR STEAMER "ROBERT J. CLOSE"

Equipped With
 Electric Welding Machine—Gas Welding Machine—Air Compressors—Electric Forges—Electric
 Lathes—Electric Drilling Machine—Electric Grinding Machine—Electric Punch and Shears—
 Electric Bolt and Pipe Machine—10-Ton Derrick

At Your Service Day or Night :: :: Boiler Repairs Our Specialty

THE SUPERIOR SHIP BUILDING CO.

SUPERIOR, WISCONSIN

Builders and Repairers of Ships of all types for
 GREAT LAKES and SALT WATER SERVICE.

②—DRYDOCKS—②

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INCORPORATED 1862

AMERICAN LLOYDS

THE STANDARD AMERICAN CLASSIFICATION OF SHIPPING

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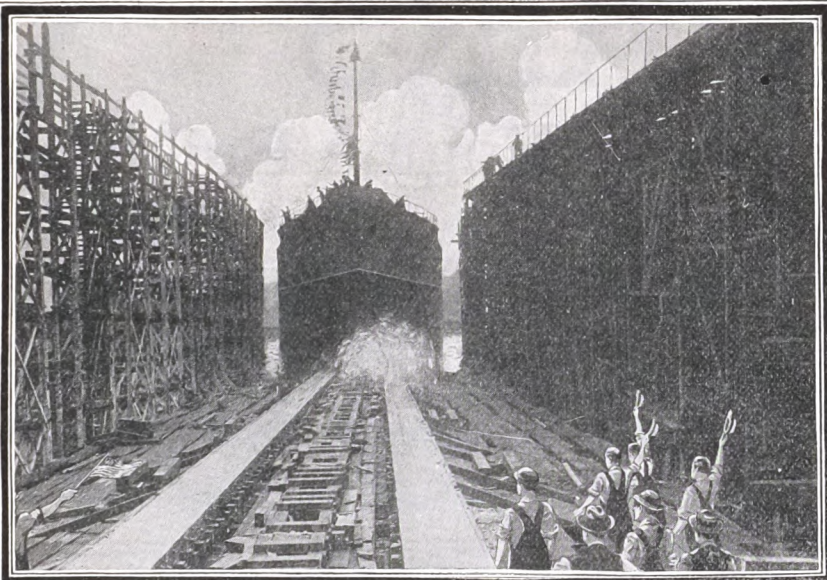
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THIS BUREAU SUPERVISES THE CONSTRUCTION OF VESSELS THROUGHOUT UNDER ESTABLISHED RULES—TESTS ALL MATERIALS FOR HULLS, MACHINERY AND BOILERS, AND PROOF TESTS ALL ANCHORS AND CHAINS, ETC. CLASSIFICATION OF A VESSEL IS A STANDARD FOR BUILDERS AND OWNERS, AND THE CERTIFICATE IS AN AUTHORITY FOR UNDERWRITERS AND SHIPPERS

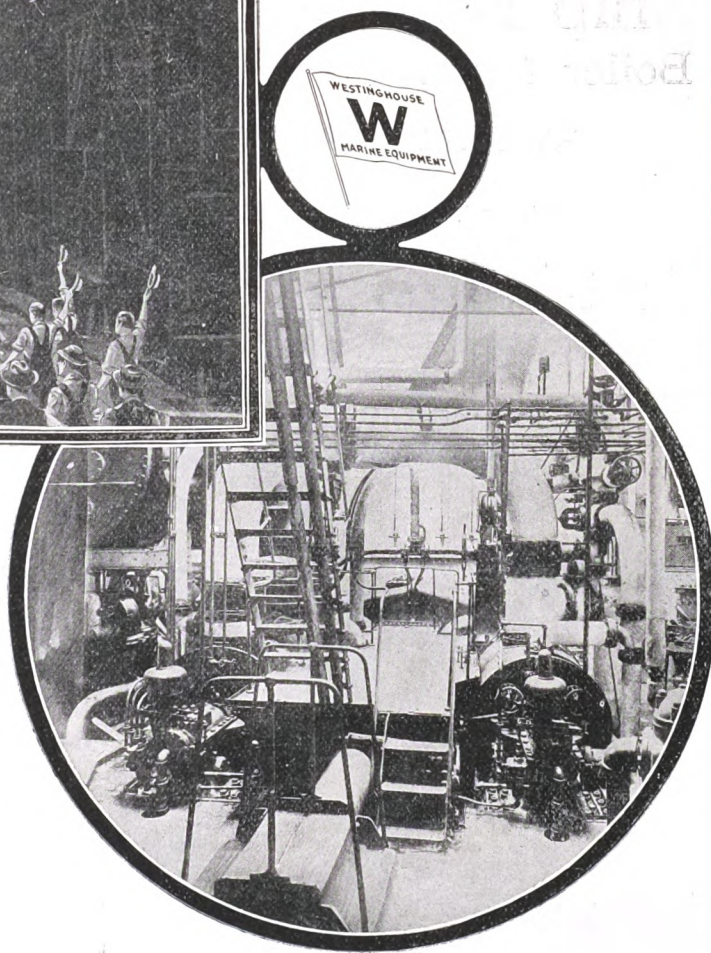
Westinghouse

Marine Equipment



These illustrations show the Engine Room and the launching of the S. S. HISCO at the Chester Shipbuilding Company's Yards, Chester, Pa.

This Oil Tanker is equipped with Westinghouse Marine Turbines, Reduction Gears and Auxiliary Apparatus. She is one of a large number now under construction at the Chester Yards—all of which are to be equipped with Westinghouse Propelling Machinery.



Westinghouse Electric & Manufacturing Co.

(MACHINE WORKS)

Successors to

The Westinghouse Machine Company
Washington, D. C. - East Pittsburgh, Pa.

Hunt, Mirk & Company
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LARGEST FLOATING DRY DOCK EQUIPMENT ON THE PACIFIC COAST

Completely Equipped Shops for Ship, Engine and Boiler

REPAIRS

Ship Builders Engine Builders
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PARSON'S MARINE STEAM TURBINES—YARROW BOILERS

Cable Address: "THREEDOCKS"—Codes: Western Union, A. B. C., 5th ed. and Bentley's

Seattle Construction & Dry Dock Company
SEATTLE, WASHINGTON



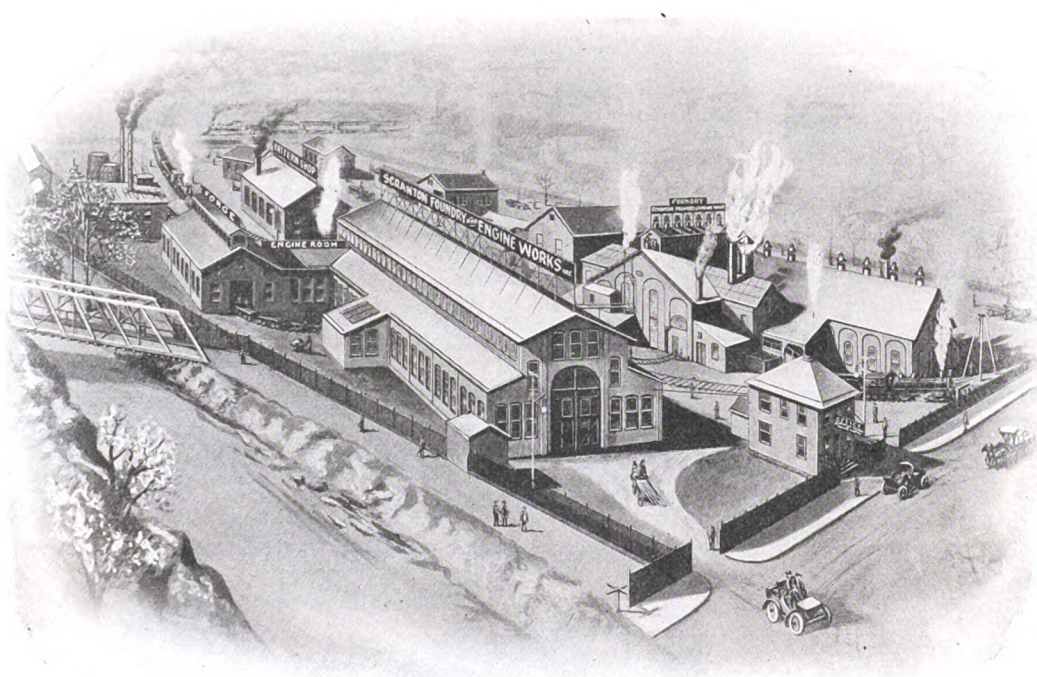
STEEL SHIPS
BOILERS - - MACHINERY
FORGINGS
SHEET METAL and GENERAL REPAIR WORK
Wood and Steel Ship Builders Marine Work and Repairs a Specialty

100 FOOT STEEL SHEAR LEGS
Also Complete Pneumatic Equipment for Marine Repair
BOAT SUPPLIES OF ALL KINDS ALWAYS IN STOCK
WRITE US
HARTMAN-GREILING CO., GREEN BAY, WISCONSIN

MARINE ENGINES

TRIPLE EXPANSION

500 to 2500 H.P.

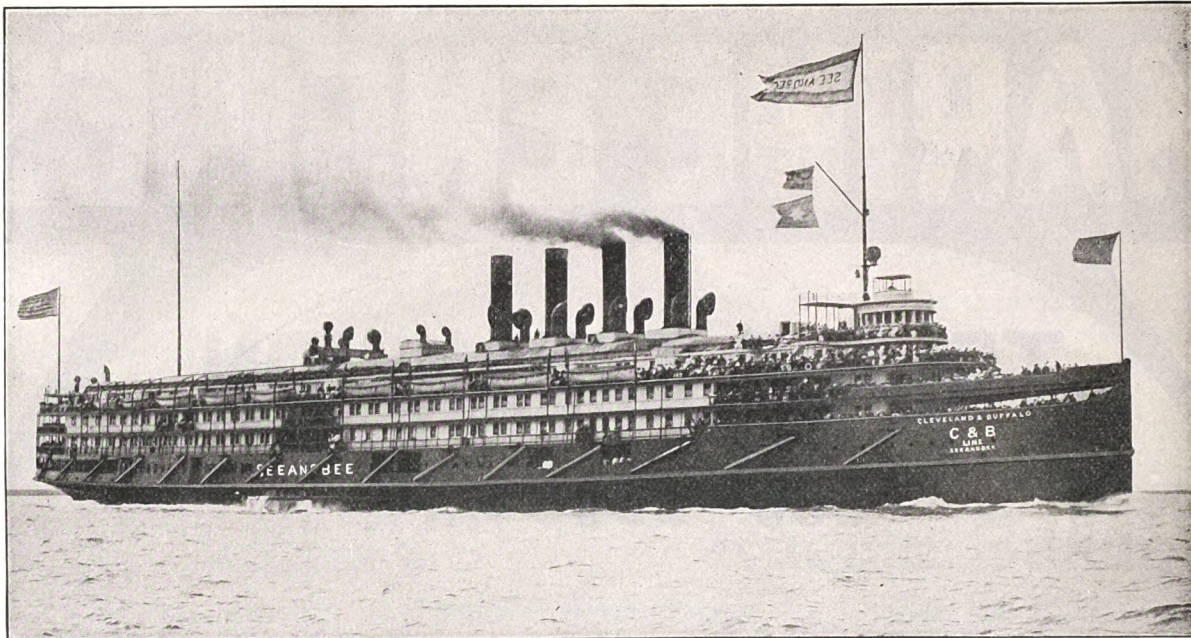


Propellers, Gray Iron Castings Ship Framing Work

Scranton Foundry & Engine Works, Inc.

Works: Scranton, Pa.

New York Office: 5 Nassau Street



BUILDERS OF "SEEANDBEE," LARGEST SIDE WHEEL STEAMER IN THE WORLD. Designers and builders of all types of
Freight and Passenger Steamers, Engines, Boilers and Auxiliary Machinery
 Manufacturers of BRASS MARINE HARDWARE and BRASS SPECIALTIES.
 Builders of *Metallic Life Boats and Clark Patent Metallic Life Rafts.*

DETROIT SHIPBUILDING COMPANY

Established 1852

Steel Shipbuilding Plant at Wyandotte, Michigan. First-class equipment for making hull and machinery repairs.

Dry Docks, Machinery Works and General Offices, Foot of Orleans Street

DETROIT, MICH.

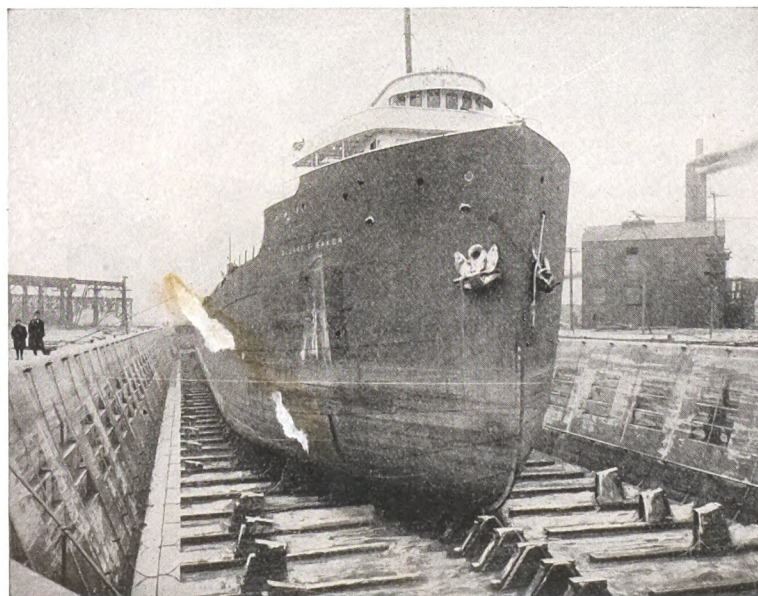
Chicago Ship Building Company

CHICAGO, ILLINOIS

We Build
Steel Ships

Passenger
or
Freight

Any Size



Steamer George F. Baker in Our New Concrete Dock at South Chicago

Dimensions of
Dry Dock

	Feet
Length -	734
Width:	
At Top -	103
At Bottom -	88
Depth -	22½

We Operate the Largest Graving Dock on Lake Michigan
Complete Facilities for Rapid Repair Work
Shops and Dry Dock at South Chicago

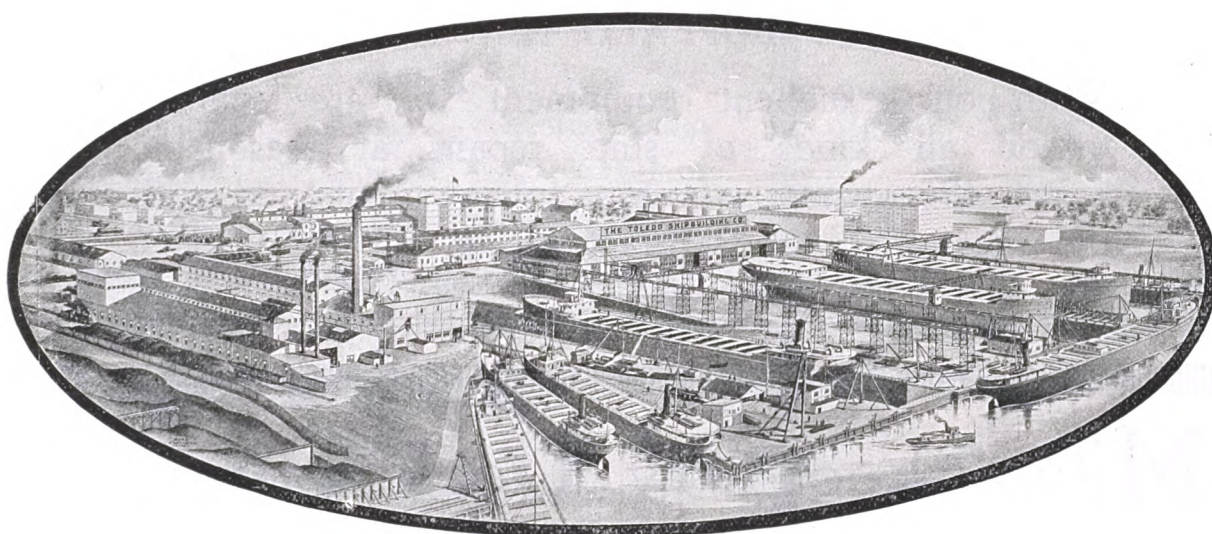
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The Toledo Shipbuilding Company

TOLEDO

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Builders and Repairers
of
Ships and Engines

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General Superintendent

A. D. BLACK,

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EDWARD HOPKINS,

Naval Architect



The Buffalo Dry Dock Company

BUFFALO, N. Y.

With our excellent equipment we are enabled to do all kinds of ship repairs at reasonable cost to the owners, whose patronage is solicited with the guarantee of satisfaction in all particulars.

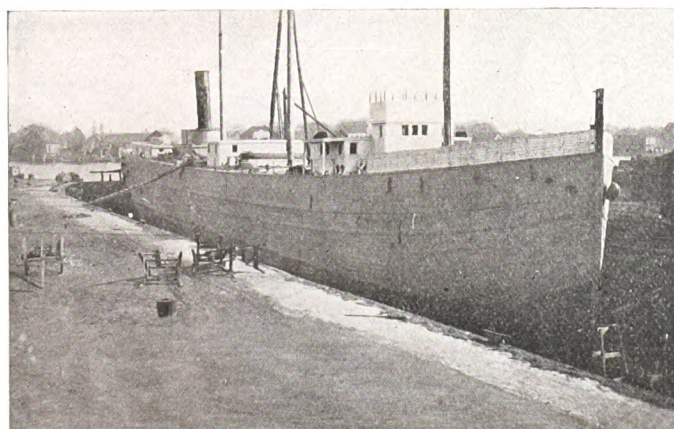
Office Telephone, Bell, 4055 Seneca; Federal, 21416

Milwaukee Dry Dock Company

Milwaukee, Wisconsin

Ship Repairs of All Kinds

ALSO MACHINE SHOP FOR ENGINE REPAIRS



Steamer "RUFUS P. RANNEY" in dry dock just before leaving the Lakes for Salt Water

We have two shipyards offering every facility for the repair of both steel and wooden vessels. South Yard Dock is 450 feet long on keel blocks; 460 feet over all; 60 feet width of gate and 16 feet over sill. West Yard Dock is 312 feet on keel blocks; 45 feet width of gate and 12 feet over sill. Rudder pit in each dock. Electric light for night work.

Telephone
Main Yard — Hanover 3

Main Office at South Yard
Foot of Washington Street

Telephone
West Yard—Hanover 2555

“ISHERWOOD” SYSTEM OF SHIP BUILDING

Experience has proved that this system gives increased strength, increased cubic and deadweight capacity, reduced cost of maintenance, and reduced vibration at no greater first cost than a vessel of similar dimensions built on the transverse system.

Owners who are contemplating the construction of new vessels, of any type whatever, will find this system of construction most advantageous and suitable for all trades.

729 vessels—representing over 5½ million tons deadweight carrying capacity and 300 bulk oil carriers—representing nearly 2,723,000 tons deadweight carrying capacity, have been built or are now on order, including a good many repeat orders from owners who have tried the system.

J. W. ISHERWOOD,

**17 Battery Place
NEW YORK CITY**

Head Office, 4 Lloyd's Avenue
LONDON, E. C.

New York Office Tel. Number
6838 Rector

Please mention THE MARINE REVIEW when writing to Advertisers

OUR DRY DOCKS SAVE TIME

Two Docks, coupled with Complete Shop Facilities, cut repair periods to a minimum

	Upper Dock	Lower Dock
Length on Keel Blocks, feet	600	437
Width of Dock Floor, feet	62	50
Draft Over Sill at Low Water	22½	22½

A COMPLETE SHIP BUILDING PLANT

Our building slips take vessels up to 350 feet long, 50 feet beam and 32 feet deep. Our yard is specially laid out for rapid construction. We also have auxiliary building slips for small craft.

Baltimore Dry Docks and Shipbuilding Company

BALTIMORE, MD.

CABLE ADDRESS—BALTODOCKS, U. S. A.

HOLDEN A. EVANS CLEMENT C. SMITH J. M. WILLIS GEORGE ALLISON EDWIN W. POE
PRES. & GEN. MGR. V. PRES. 2nd V. PRES. TREASURER SECRETARY

Tietjen & Lang Dry Dock Co.

HOBOKEN, N. J.

**NINE
DRY DOCKS**

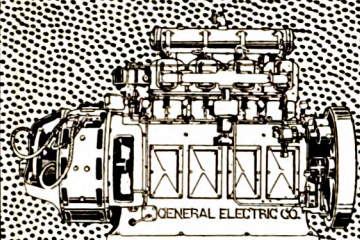
General Repairs on Wooden and Iron Vessels

FT. OF 17th STREET

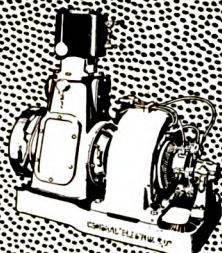
Telephone 700 Hoboken

HOBOKEN, N. J.

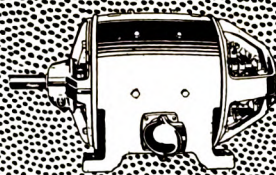
Complete Electrical Equipment for Marine Service



Gas Electric
Generator



Steam Generating
Set



Motor



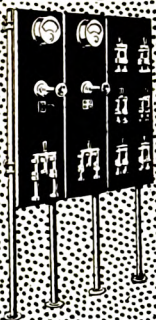
Marine Arc Lamp



Fan



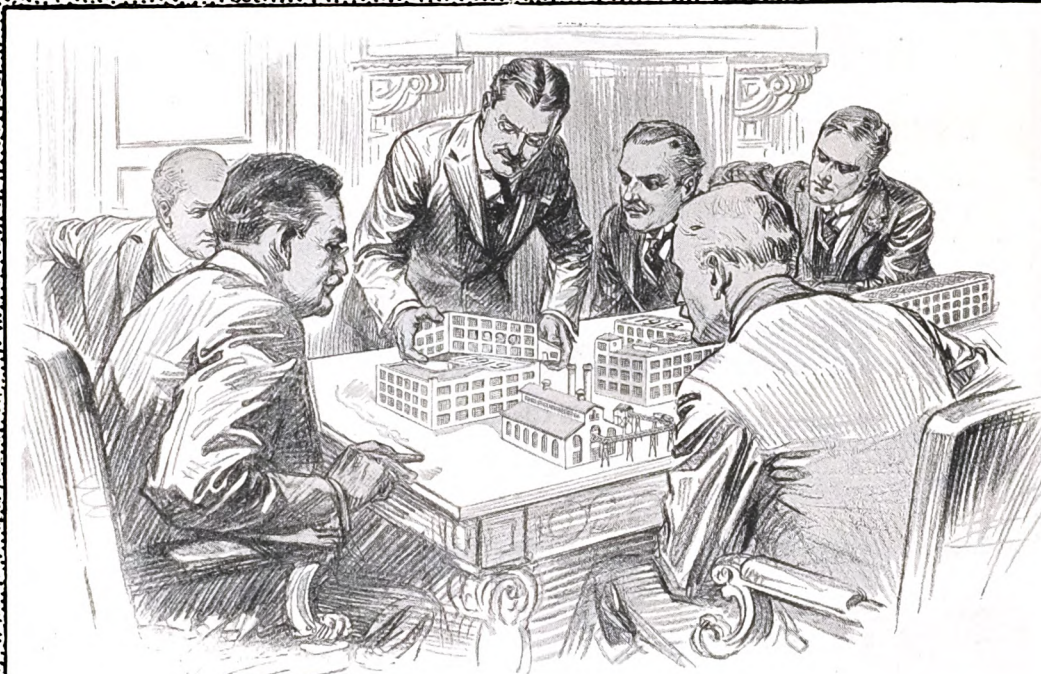
Searchlight



Switchboard



Mazda Lamp



"These manufacturing additions will be electrically equipped"

When you contemplate additions to your shipyard or fleet call in your engineer, consider the electrical requirements and place your orders at once.

This will insure best deliveries for any special apparatus as well as standard equipment

General Electric Company

Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
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Charlotte, N. C.
Chattanooga, Tenn.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio

Columbus, Ohio
*Dallas, Tex.
Dayton, Ohio
Denver, Colo.
†Detroit, Mich.
Des Moines, Iowa
Duluth, Minn.
Elmira, N. Y.
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Fort Wayne, Ind.
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General Office· Schenectady, N. Y.

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Portland, Ore.
Providence, R. I.
Richmond, Va.
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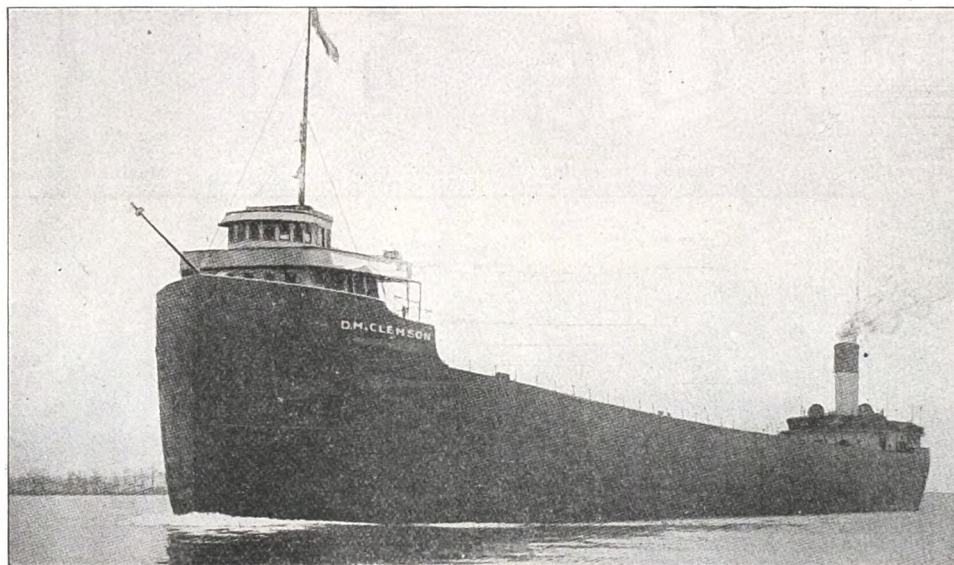
St. Louis, Mo.
Salt Lake City, Utah
San Francisco, Cal.
Schenectady, N. Y.
Seattle, Wash.
Spokane, Wash.
Springfield, Mass.
Syracuse, N. Y.
Toledo, Ohio
Washington, D. C.
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*Southwest General Electric Company †General Electric Company of Michigan,
For CANADIAN BUSINESS refer to Canadian General Electric Company, Ltd., Toronto, Ont.
GENERAL FOREIGN SALES OFFICES: Schenectady, N. Y., Equitable Building, 120 Broadway, New York City; 83 Cannon St., London, E. C. England.

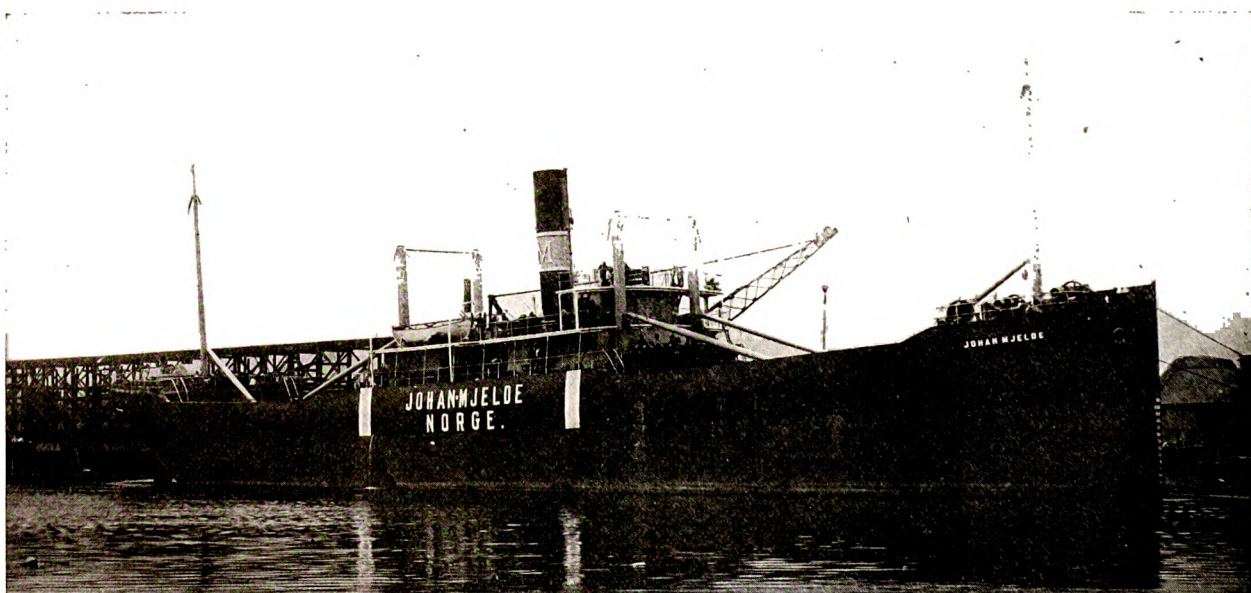
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The American Ship Building Company

CLEVELAND, OHIO



Steamer D. M. Clemson, 600 feet over all; 60-foot beam;
12,000 tons capacity. Built at Lorain Yard.



Steamer Johan Mjelde, 261 feet over all, 43-6 beam,
3200-ton dead weight. Built at Cleveland yard.

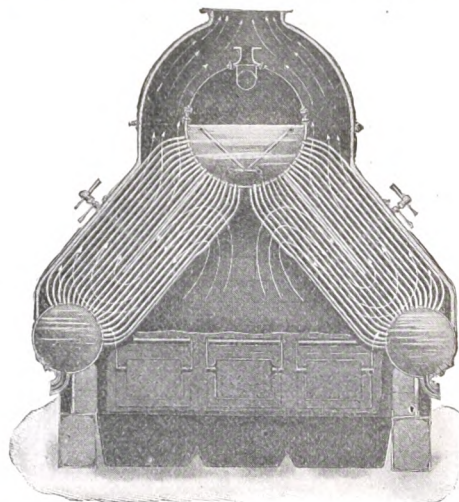
We also furnish and install all kinds of marine and stationary engines, boilers, windlasses and auxiliary machinery.

Complete shipyards at Cleveland and Lorain, Ohio. Also operating three dry docks at Cleveland and two at Lorain, with improved modern equipment for the repairing of ships.

THE COLVEN MARINE BOILER

THE COLVEN
stands for
S A F E T Y

THE COLVEN
gives
E F F I C I E N C Y



THE COLVEN
means
R E L I A B I L I T Y

THE COLVEN
is
S I M P L I C I T Y

THE COLVEN MARINE BOILER

is a highly specialized product, built only for marine work. No handholes and fitted joints to be kept tight. No flat surfaces to be stayed. The highest economy and steaming capacities within the smallest space and weight.

*IF YOU HAVE A RUSH JOB WE CAN HELP YOU.
CONSULT US. Send for Booklets.*

NEW YORK ENGINEERING COMPANY
2 RECTOR STREET NEW YORK

The Geyser Boiler Cleaner

(Patented)

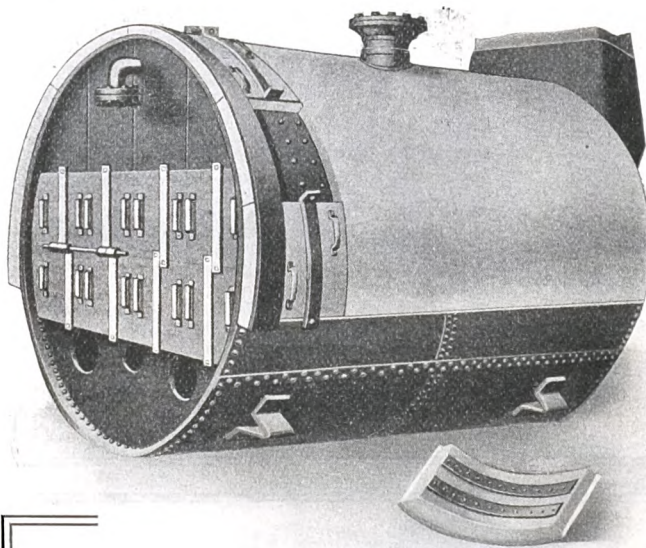
A common sense method of preventing scale formation in Scotch boilers, removing mud and sludge instantly and entirely, without disturbing the operation of the boiler.

The Geyser Boiler Cleaner obviates the necessity of periodical boiler cleaning, saving repair and other expenses incident to cooling down and heating up boiler when being cleaned.

Write for description and details

Manufactured by

Detroit River Iron Works
661-663 Atwater St. Detroit, Michigan



Something New!

A Boiler Covering in Panels

Your stay bolts instantly accessible. Each panel can be quickly removed and replaced.

Carey Covering in Panels

Is made to fit every size and type of boiler. Easy to install on old boilers—a saving in time and money on new construction.

Send for special Folder and Prices.

The Carey Company

Euclid Avenue

CLEVELAND, O.

Preparation or Reparation?

¶ The more **Preparing** we do—the less **Repairing** we have to do. Proofs of this confront us at every turn. As an example, consider the repairs those Scotch Boilers of yours will need this winter. Isn't some of this repair work due to **lack of preparation**?

¶ One Supt. Engineer on the Great Lakes says that ECKLIFF CIRCULATORS and PURIFIERS reduced boiler repairs to "almost nothing"—another says "at least 75%". Eckliffs will **reduce your** boiler repairs and **increase your** boiler efficiency. **Write now** for folder.

NOTE:—Ask about the Life-saving, Time-saving
J-H LIFEBOAT WINDLASSES and RAPID RELEASING HOOKS
Write for Illustrated Folder.

Eckliff Circulator Company

Detroit

54 Shelby Street

Michigan

New York

Philadelphia

Chicago

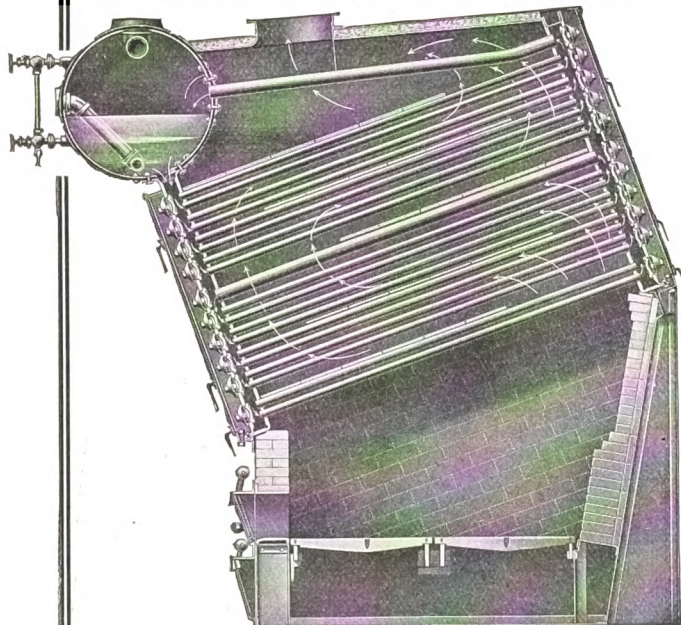
San Francisco

Portland

Seattle

270

WARD'S WROUGHT STEEL MARINE BOILER



ADOPTED BY U. S. GOVERNMENT

GENERATING TUBES EXPANDED. NO OTHER
JOINTS. NO NIPPLE CONNECTIONS.
NO STAYBOLTS.

The Charles Ward Engineering Works

CHARLESTON, WEST VIRGINIA
MARINE ENGINES RIVER STEAMERS

Ballin Water Tube Boilers

The only SECTIONAL BOILER
with VERTICAL TUBES

INSTALLED IN

	Fireboats
S. S. "H. B. Kennedy"	2500 I. H. P.
S. S. "Tacoma"	3680 I. H. P.
Ferry "Leshi"	1250 I. H. P.
S. S. "Rose City"	3000 I. H. P.
S. S. "Solduc"	1500 I. H. P.

Suction Dredges

U. S. Seagoing Dredge	"Duwamish"	1500 I. H. P.
"P. S. Michie"	"Tualatin"	2500 I. H. P.

Steam generated in **Vertical Tubes** can escape to the steamdrum by its natural buoyancy, while in horizontal tubes it can only be liberated after being forced with the water into the steamdrum. Think about this important feature and understand why **BALLIN BOILERS** furnish dry steam.

Because of **Vertical Tubes** **BALLIN BOILERS** can use smaller tubes, which means **Safety, Light Weight, Ease of Repairs and Compactness.**

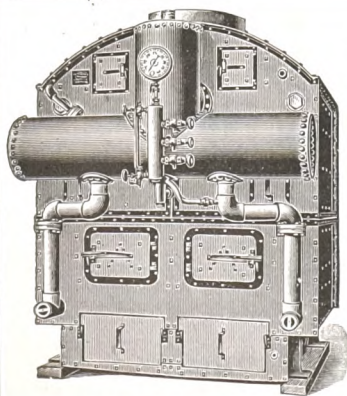
BALLIN BOILERS have a large **Combustion Chamber**; all Engineers know its importance.

Sediment will not lodge in **Vertical Tubes**, for this reason the Engineers like them.

For Further Information Address

Ballin Water Tube Boiler Co.
Portland, Ore.

or FRED A. GARDNER, San Francisco Agent
528 Merchants Exchange Bldg., San Francisco



CATALOGUE FREE

Almy Water Tube Boiler Co.

Builders of
Sectional Water
Tube Boilers
for all types of
vessels

Providence, R. I.
U. S. A.

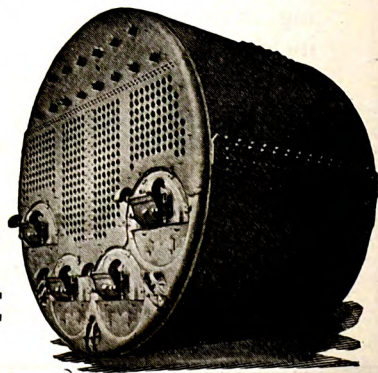
Commercial Boiler Works

Manufacturers
and Repairers
of Boilers

Marine Work a
Specialty

All Kinds of
Sheet Iron Work

SEATTLE
U. S. A.



Morison Suspension Boiler Furnaces



For Land
and
Marine Boilers

Uniform Thickness,

Easily Cleaned,

Unexcelled for Strength.

Also FOX CORRUGATED FURNACES

Manufactured by

THE CONTINENTAL IRON WORKS

West and Calyer Sts., BOROUGH OF BROOKLYN, N. Y.

ESTABLISHED 1859

Greenpoint Ferry from East 23rd Street, New York

INCORPORATED 1887

The Anderson Model "D" Steam Trap

*makes your steam using apparatus more efficient
by delivering live hot steam to it*

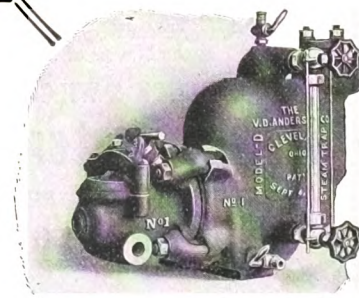
It also permits you to obtain the highest efficiency from each square foot of heating surface in your plant, by removing the condensation of your steam as fast as it accumulates.

It operates continually and automatically at pressures varying from 250 pounds, to gravity.

All parts of the Model "D" Steam Trap are accurately machined to solid gauges and can be replaced at any time, as every part is made interchangeable.

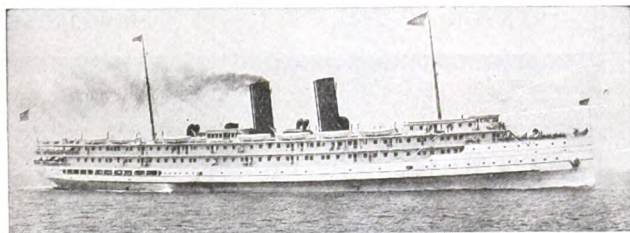
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The V. D. Anderson Company, Cleveland, Ohio



We are also manufacturers of Steam and Oil Separators; Water Columns; Air Traps; and Oil and Moisture Expellers.

PARSON'S MARINE TURBINES



TURBINE STEAMSHIPS YALE AND HARVARD

Marine Engines, Boilers
and Machinery of All Kinds

Contractors for
Vessels Complete

W. & A. FLETCHER COMPANY, Hoboken, N. J.

REDUCE COAL BILLS



S. S. PEARL SHELL

Equipped with Scotch Boilers and High Degree Superheaters

Excessive coal costs can be reduced by high superheat.

Applied between trips or at regular over-hauling periods it will save 15% in coal costs.

35 per cent is what your investment in high degree superheaters will pay.

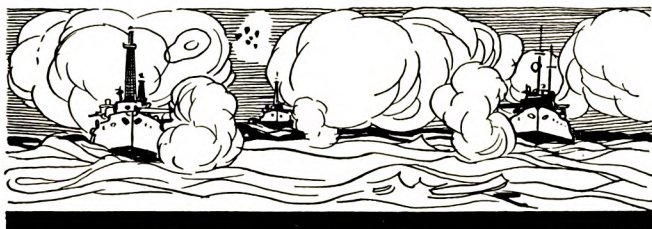
Our Marine Engineers will promptly reply to your inquiries.

Locomotive Superheater Co.

MARINE SUPERHEATERS

30 Church Street, New York

Peoples Gas Bldg., Chicago



Holding the Records in the Navies of the World

The records for Economy, Capacity and Endurance in the Navies of the World, are held by

BABCOCK & WILCOX FORGED STEEL

Marine Water-Tube Boilers and Superheaters

Moreover, the same superior characteristics have been proved in the Merchant Marine.

Do you know that Babcock & Wilcox Boilers and Superheaters in one vessel are saving more than 15 per cent over Scotch boilers in sister vessels?

Isn't such a great reduction in coal bills of very great interest to you?

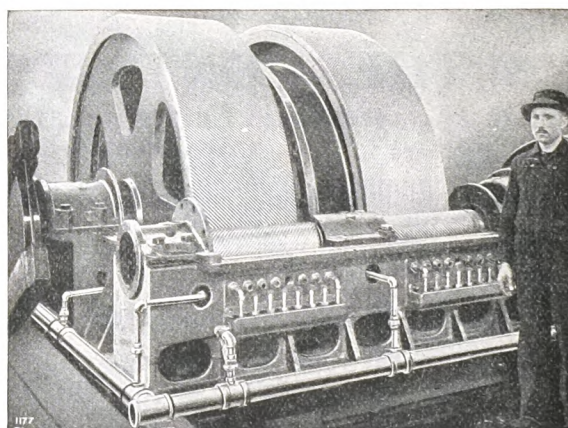
All essential parts of Babcock & Wilcox Boilers are heavier than the corresponding parts in Scotch boilers, thus giving greater security against corrosion.

Let us send you full details explaining why "Babcock & Wilcox" stands for **safety, ease of cleaning and simplicity of operation.**

A large portion of our business consists of "repeat-orders." You know what that means. **Write us at once.**

The Babcock & Wilcox Co.

NEW YORK and LONDON



An Efficient, Reliable Gear

One of the large steamship companies is building a number of 17½ knot passenger vessels, each of which is to be equipped with twin screws, driven by geared turbines.

The turbines are of the De Laval compound type, consisting of a high-pressure section mounted upon one shaft and a low-pressure section mounted upon the other, pinions upon the two turbine shafts meshing with a single gear, connected to the propeller shaft. One of these gears is shown herewith. The turbines run at 1500 r. p. m. and the propellers at 120, each propeller requiring about 4500 h. p.

The high and low pressure turbine arrangement gives high efficiency and at the same time a virtual duplication of the turbine machinery, since in the case of necessity, either half of the turbine can be operated alone upon steam at boiler pressure.

Geared turbines make the most simple, reliable and economical drive for ships.

State size, speed and character of proposed ship and ask for our Booklet No. M 63.

DE LAVAL STEAM TURBINE CO.
TRENTON NEW JERSEY

277

THE CHASE MACHINE CO.

ENGINEERS AND MACHINISTS

*Mooring Machines, Deck Winches,
Steam Capstans, Etc., Etc.*

Address 2313 Elm St. N. W.

Cleveland, Ohio

Fore River Ship Building Corporation

QUINCY, MASS.

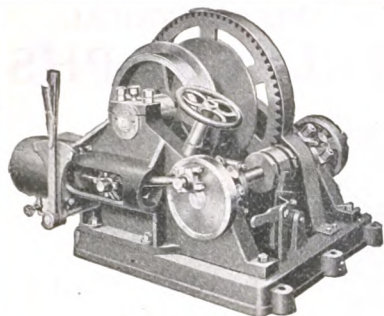
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Brass Founders Machinists Galvanizers

Curtis Marine Turbines

Yarrow Watertube Boilers

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Steam Deck Engine

Write us for advice on
Special Engineering Problems

DECK ENGINES

Steam and Electric

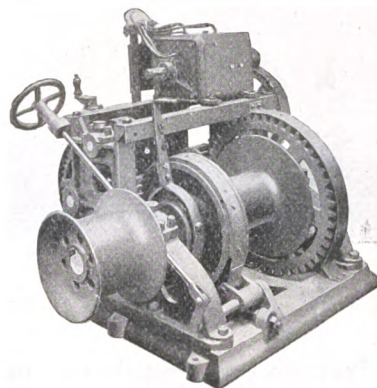
Anchor Hoists

Winches

Electric Telemotors

We also build Cargo Hoists, Ash Hoists, Steam Gearing Engines, Hand Steering Gears, and all kinds of auxiliary machinery for sea going merchant vessels.

Superior Iron Works Company
Superior, Wisconsin



Electric Winch

Let Your Next Pump Be A

Blackmer

Blackmer pumps have been in use now over twelve years.

Ask your competitor what he has to say about them.

Capacities from 5 to 500 gallons.

Wear automatically taken up.

Latest catalogue giving full particulars is yours for the asking.

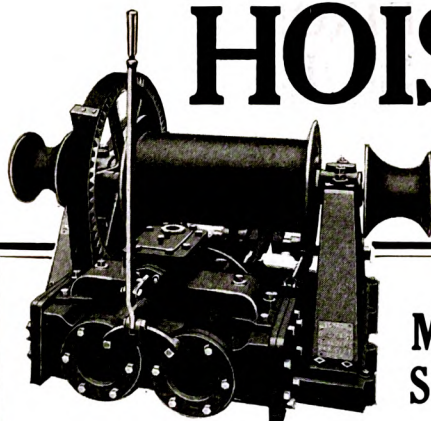


Guaranteed
against
pressures.

Blackmer Rotary Pump Co.
Petoskey, Mich.

HOISTS

for



**MARINE
SERVICE**

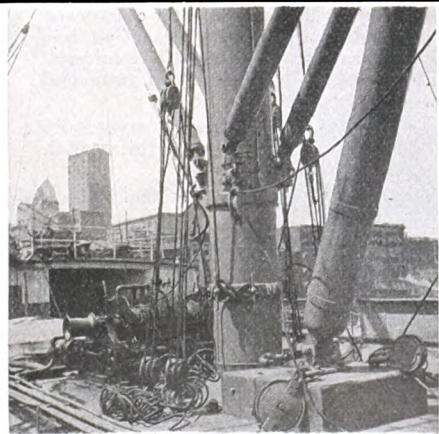
Save time and labor by placing a "Michigan" Hoist aboard!

Used for hoisting anchor, heavy deck work and all kinds of stationary hoisting.

Made in three sizes.

Write for details

MICHIGAN DREDGE CO.
BAY CITY, MICH.



Durable Wire Rope Co.

93-95 Pearl St., Boston, Mass.

Durable Wire Rope will Not Rust or Rot and is not affected by Salt Water or Climatic Conditions

FOR

Mooring Lines
Ship Rigging
Hoisting

Towing Hawsers
Dredging
Coal Pockets

Stevedoring
Boat Falls
Pile Driving

Tiller Ropes
Yacht Rigging
Fasts

BRANCH OFFICES

165 W. Lake St., Chicago, Ill. 701 St. Clair Ave. N. E., Cleveland, O.
NEW YORK AGENTS: HEGEMAN & WARD, 43 SOUTH STREET



Barge built by Kelley, Spear & Co., Bath, Me., for the Northern Transportation Co. Hull above water-line painted with Dixon's Silica-Graphite Paint, black.

Paint economy is not the price paid but the number of years of service given. Longest protection against storms, salt air, and other deleterious conditions is given by

DIXON'S Silica Graphite PAINT

when used for all metal or wood work **not** under water. It has been made in First Quality Only for over Fifty years.

Our Paint Department is prepared to advise promptly regarding your paint problems.

Write for Booklet No. 77-B and advice.

Made in JERSEY CITY, N. J., by the
Joseph Dixon Crucible Company



ESTABLISHED 1827



MECHANICAL AND ELECTRICAL SHIPS TELEGRAPHS



Rudder Indicators

Shaft Speed Indicators

Electric Whistle Operators

Electric Lighting Equipments, Fixtures, Etc.

Electric and Mechanical Bells

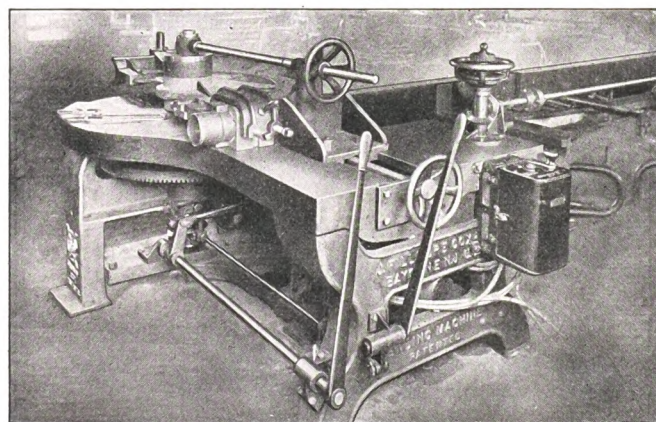
Annunciators, Alarms, Etc.

Loud Speaking Marine Telephones

Installations

Chas. Cory & Son, Inc.

290 HUDSON STREET, NEW YORK CITY



MODERN TUBE BENDING MACHINE RECENTLY
INSTALLED BY RUSSIAN ADMIRALTY,
BRAZILIAN GOVERNMENT AND
VARIOUS SHIPYARDS.

Cut Your Costs Better & Cheaper Bends Faster Work

Makers of World's Best Crude Oil Burners

J. Fillmore Cox
Engineering and
Tube Bending Machine Works
BAYONNE, N. J., U. S. A.

N. B. O.

The Original Black Sheet Packing

The original Black Sheet and the most effective packing of the kind. Why? It is a scientific and at the same time a secret formula which our many competitors have endeavored to discover by having N. B. O. analyzed and otherwise, but without success, with the result that N. B. O. is and always has been the absolute master of the field.

Other N. B. O. Products

N. B. O. Pump Valves made soft, medium and hard, for all high duty services.

N. B. O. Steam Hose—With a tube of genuine N. B. O. stock that positively cannot harden up under any steam pressure. In use on the leading railroads of the country and in many other places where other makes of Steam Hose have been tried and where none but the best will be considered.

N. B. O. Tubular Gaskets—An article that is guaranteed to give you very superior service.

N. B. O. Rings and Spiral—For refrigeration service. By many experiments and tests it has been proven that N. B. O. is the best ammonia resisting stock made.

N. B. O. "Keep-it-tite" Washers—For the stem of globe valves.

N. B. O. Flat Gaskets and Rings—As is the case with sheet packing, these have demonstrated their fitness everywhere.

Manufactured Exclusively By

HOME RUBBER COMPANY
TRENTON, NEW JERSEY

Pennsylvania Shipbuilding Company

BUILDERS OF

GENERAL CARGO STEAMERS

7,500 TO 12,500 TONS D. W. 11 KNOTS

BULK OIL STEAMERS

7,000 TONS D. W. 11 KNOTS

Yards at GLOUCESTER CITY, N. J. Office: LAND TITLE BLDG., PHILADELPHIA

Companies Organized
and Financed

Louis N. Fuller

**SPECIALIST IN
SHIPBUILDING**

163 Hollis Street, HALIFAX, N.S.

Ships Bought and Sold

Organizer of

LOGAN TANNERIES, LIMITED
PICTOU, N.S.

EASTERN STEEL CO., LIMITED
NEW GLASGOW, N.S.

TRURO STEEL CO., LIMITED
TRURO, N.S.

TUSKET SHIPBUILDING CO., LTD.
TUSKET, N.S.

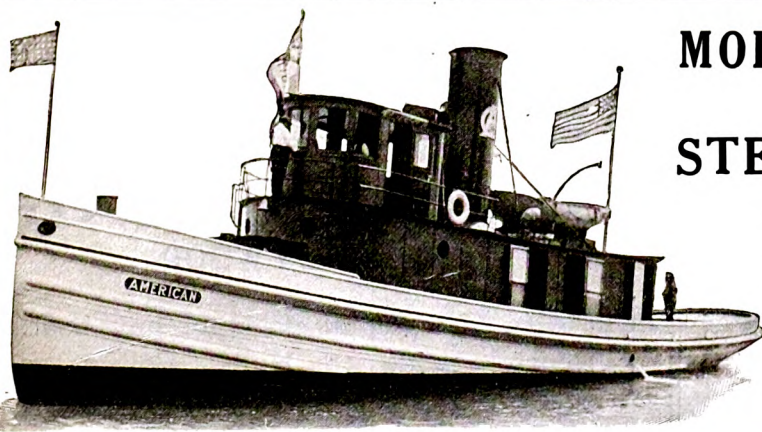
SHIPYARDS



WE OFFER AN UNUSUAL SERVICE
IN THE RAPID DESIGN AND
CONSTRUCTION OF MODERN
SHIPBUILDING PLANTS - - -

SAGINAW SHIPBUILDING CO.'S PLANT
AT SAGINAW, MICH. IS BEING COM-
PLETED IN SIXTY DAYS - - -

FRANK D. CHASE
INDUSTRIAL ENGINEER
PEOPLES GAS BUILDING, CHICAGO
WHITEHALL BUILDING, NEW YORK



MODERN MARINE BOILERS and STEEL SHIP BUILDING

TUGS, PASSENGER STEAMERS
and SPECIAL CONSTRUCTION

WRITE

JOHNSTON BROTHERS
FERRYSBURG, MICHIGAN

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Manitowoc Shipbuilding Co.

Designers and Builders of

Steel Passenger Boats
Steel Freighters
Sand Suckers
Dredges

Floating Cranes
Lighters
Fireboats
Tugs
Dump Scows

Marine Engines
Semi-Diesel Engines
Marine Boilers
Deck Machinery, etc.

Facilities for prompt and economical repairs

MANITOWOC, WISCONSIN



Thermit Weld on S.S. "J. J. H. Brown."

The Use of Thermit for Marine Repairs

Broken stern frames, rudder frames, connecting rods, rudder stocks, crank shafts, tail shafts, and many other similar sections can be repaired very quickly and easily with Thermit.

A stern frame can be welded in place without keeping the vessel out of service more than two or three days.

Worn rudder stocks can be built up or new sections can be welded on.

Write for Pamphlet No. 3440, which gives full particulars.

If you are in a hurry wire or telephone our nearest office.

GOLDSCHMIDT THERMIT COMPANY

Equitable Bldg., 120 Broadway, New York City

329-333 Folsom St., San Francisco 7300 So. Chicago Ave., Chicago
103 Richmond St., W., Toronto, Ont.

ELECTRIC WELDING

We go Right to the Job!

We are welding specialists. With our complete welding equipment on a motor truck, we are able to go any place that we are called.

Prompt Service Reasonable Prices

We also specialize in
BOILER MAKING
in all its branches

PIONEER BOILER WORKS

Bruce M. Wright, Mgr.

Bard and Merchant Sts. PORT HURON, MICH.



RIVETS

"PERFECTION"

Boiler, Ship and Structural

Made from Carnegie Steel
Highest Grade Rivets Made

Diam. $\frac{1}{2}$ " to $1\frac{1}{2}$ ". All Lengths

Write for Prices and Monthly Stock Lists

Anthony Carlin, Mfr., Cleveland

Sydney C. McLouth

Marine City, Mich.

SHIP BUILDING

STEEL and WOOD

Plenty of water at dock for any boat. Repairs made to Hulls, Boilers or Machinery, nights, days or Sundays.

HEAVY HARDWARE
GALVANIZED
AND
PLAIN

Boat and Deck Spikes
Screw and Blunt Bolts
Wrought Iron Washers
Malleable Clinch Rings
Boat and Fender Iron

REFINED IRON BARS

TURNBUCKLES AND RODS

Anchor and Rigging Chains
Anchors
Rivets
Cast Washers
Chocks and Cleats

All materials guaranteed to stand the
Government tests and specifications

SCHAPER CONSTRUCTION MATERIAL CO
90 West Street
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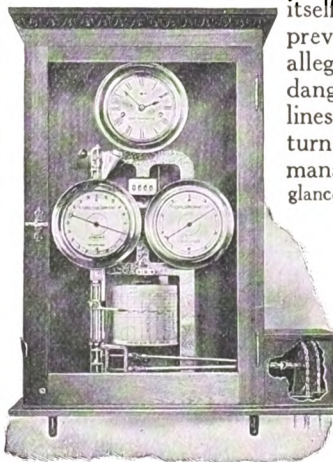
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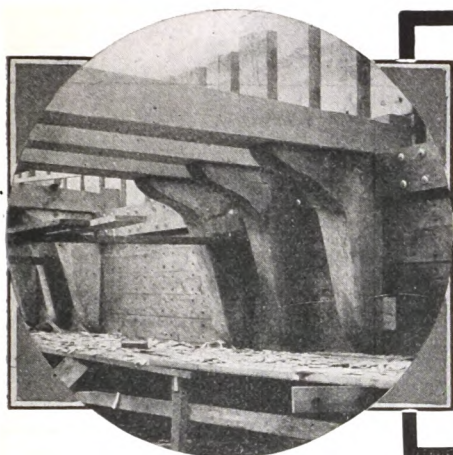
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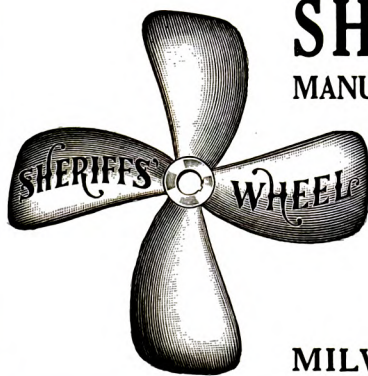
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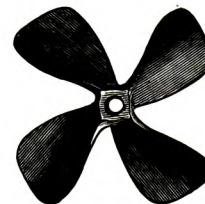
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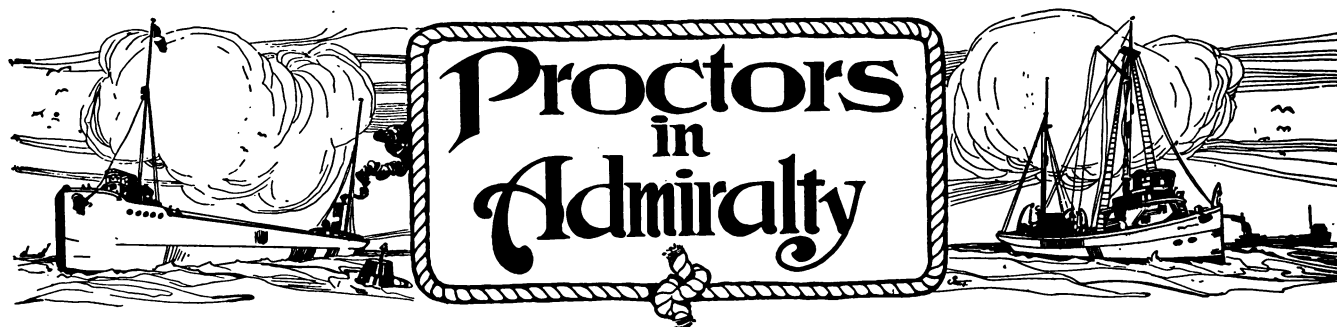
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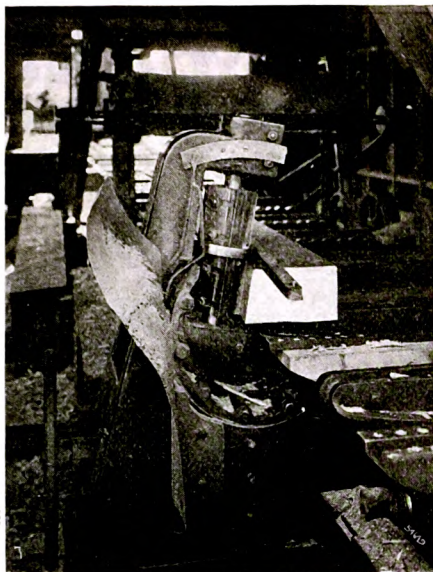
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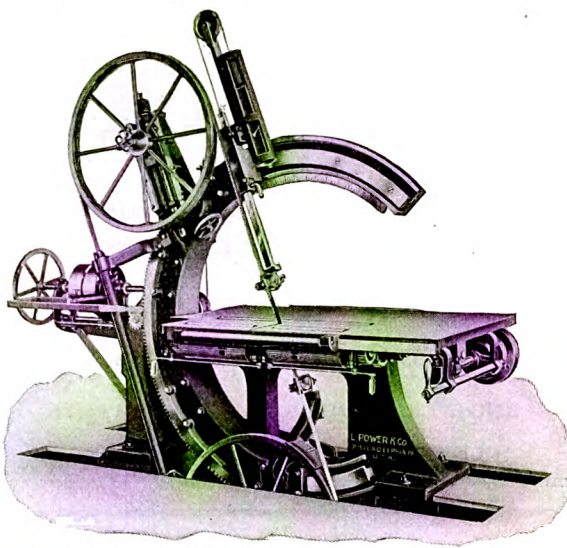
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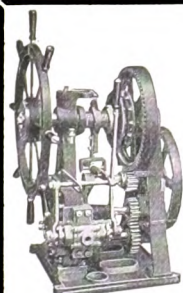


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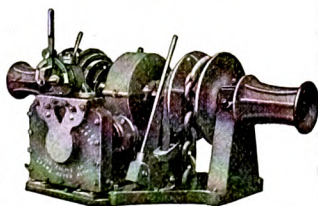
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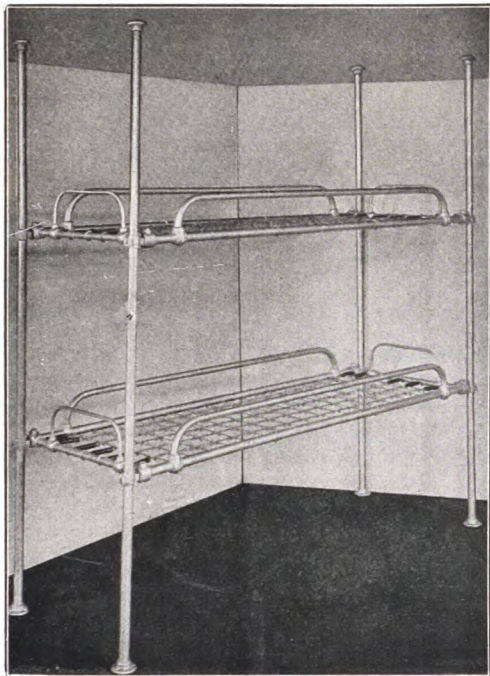
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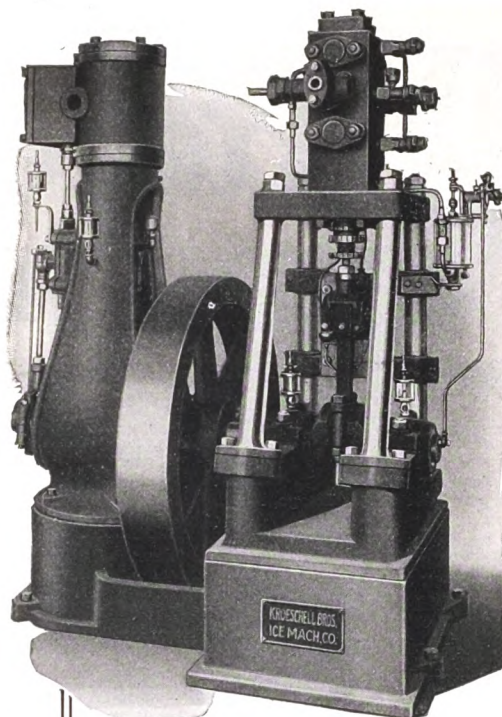
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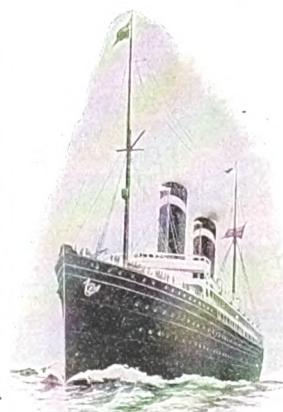
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CHEAPEST because they will outlast any ship, dock or pier. No splinters - no cracks - no costly replacements.

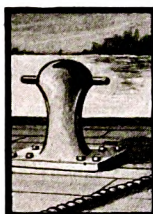


SAFEST because they cause least wear and tear on the ropes, and so help to lessen the danger of accident and loss of life.

The U.S. Government uses Central Foundry Cast Iron Mooring Fixtures extensively - for example - the equipment of the Panama Canal.

GENERAL CASTINGS: Castings made to your own Specifications and Blue Prints - in foundries with ample facilities for most exacting requirements.

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THE NEW INCOME AND EXCESS PROFITS TAX LAW

calls for returns based mainly on average net income and capital invested. The proper interpretation of these terms is of the utmost importance to all business men.

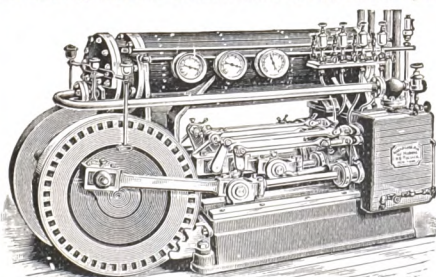
Our Public Accounting Department will audit and examine books and records for the purpose of obtaining reliable data touching on all phases of the new law.

Systems installed complying with all governmental requirements. Consultations and work strictly confidential. Full particulars upon request.

THE MICHIGAN TRUST CO.
GRAND RAPIDS, MICHIGAN

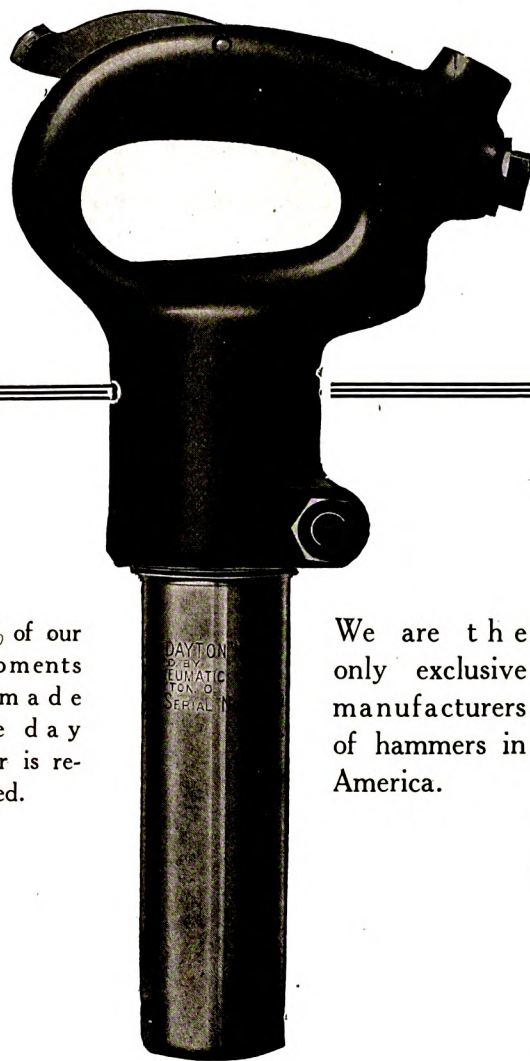
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contains no chemicals. It is placed in the engine room, while the ice-making box and meat rooms are at distant places of the steamer.



Over two hundred in daily service in the tropics on men-of-war, steam yachts and mercantile steamers.

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90% of our shipments are made the day order is received.

We are the only exclusive manufacturers of hammers in America.

For years we have studied to produce a hammer whose simplicity would make it practically immune from repair. We have at last accomplished our task. In the

Greater Dayton Pneumatic Hammer

you will find a hammer whose simplicity of design and small number of operating parts make it the cheapest operating hammer on the market.

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Let us ship you a Greater Dayton on trial. If not satisfactory, return at our expense.

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Hanna, M. A., & Co., Cleveland, O.
Lorain Coal & Dock Co., Columbus, O.
Pickands, Mather & Co., Cleveland, O.

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Anderson, The V. D., Co., Cleveland, O.

COMPASSES.

Ritchie, E. S., & Sons, Brookline, Mass.

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Gardner Governor Co., Quincy, Ill.

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Whitlock Cordage Co., New York, N. Y.
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Williams, Wm. E., New York, N. Y.

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Whiting Foundry Equipment Co., Harvey, Ill.

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Electric Welding Co., New York, N. Y.
Pioneer Boiler Works, Port Huron, Mich.

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Linde Air Products Co., New York City.

CYLINDERS (Welded.)

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Long Island City, N. Y.

DAVITS AND DAVIT FALLS.

Welin Marine Equipment Co.,
Long Island City, N. Y.

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Jewell Water Improvement Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

DIVING APPARATUS.

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Schrader's, A., Sons, Inc., Brooklyn, N. Y.

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Superior Ship Building Co., Superior, Wis.

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DROPS (Wharf.)

American Engineering Co., Philadelphia, Pa.

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American Ship Building Co., Cleveland, O.
Baltimore Dry Dock & Ship Bldg. Co.,
Baltimore, Md.
Buffalo Dry Dock Co., The, Buffalo, N. Y.
Chicago Ship Building Co., Chicago, Ill.

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Collingwood, Ont., Can.

Detroit Ship Building Co., Detroit, Mich.
Manitowoc Ship Building Co., Manitowoc, Wis.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Pennsylvania Ship Building Co., Philadelphia.
Rocky River Dry Dock Co., Rocky River, O.
Seattle Construction & Dry Dock Co.,
Seattle, Wash.

Sun Shipbuilding Co., Philadelphia, Pa.
Superior Ship Building Co., Superior, Wis.
Tietjen and Lang Dry Dock Co.,
Hoboken, N. J.

Toledo Ship Building Co., Toledo, O.
Winslow Marine Railway & Shipbuilding Co.,
Winslow, Wash.

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General Electric Co., Schenectady, N. Y.
Westinghouse Machine Co., E. Pittsburgh, Pa.

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Camden Forge Co., Camden, N. J.

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American Injector Co., Detroit, Mich.

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Westinghouse Machine Co., E. Pittsburgh, Pa.

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Babcock & Penton, Cleveland, O.
Chase, Frank D., Chicago, Ill.
Donnelly, Wm. T., New York, N. Y.
Griscom-Russell Co., New York, N. Y.
Seattle Construction & Dry Dock Co., Seattle.
Smith Bros., Buffalo, N. Y.

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Lunkenheimer Co., The, Cincinnati, O.
Penberthy Injector Co., Detroit, Mich.
Williams, Wm. E., New York, N. Y.

ENGINES.

Superior Iron Works, Superior, Wis.

ENGINES (Diesel.)

Bolinders Co., New York City.
New London Ship & Engine Co., Groton, Conn.

ENGINES (Marine.)

American Ship Building Co., Cleveland, O.
Bolinders Co., New York City.
Chicago Ship Bldg. Co., So. Chicago, Ill.
Collingwood Ship Building Co., Ltd.,
Collingwood, Ont., Can.

Detroit Ship Building Co., Detroit, Mich.
Fletcher, W. & A., Co., Hoboken, N. J.
Johnston Bros., Ferrysburg, Mich.
MacKinnon Boiler & Machine Co.,
Bay City, Mich.

Manitowoc Ship Building Co., Manitowoc, Wis.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Pennsylvania Ship Building Co., Philadelphia.
Scranton Fdy. & Engine Works, New York.
Seattle Construction & Dry Dock Co.,
Seattle, Wash.

Sun Shipbuilding Co., Philadelphia, Pa.
Superior Ship Building Co., Superior, Wis.
Toledo Ship Building Co., Toledo, O.
Trout, H. G., Co., Buffalo, N. Y.
Ward, Chas., Engrg. Wks., Charleston, W. Va.
Winslow Marine Railway & Shipbuilding
Co., Inc., Winslow, Wash.

ENGINES (Oil.)

Bolinders Co., New York City.
New London Ship & Engine Co., Groton, Conn.

ENGINES (Steering.)

La Belle Iron Works, Steubenville, O.

EVAPORATORS.

Griscom-Russell Co., New York, N. Y.

EYE BOLTS.

Topping Brothers, New York City.

FENDERS

Kahnweiler's Sons, David, New York, N. Y.

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Wardwell Mfg. Co., Cleveland, O.

FILTERS (Feed Water.)

Ross Valve Mfg. Co., Troy, N. Y.
Williams, Wm. E., New York, N. Y.

FILTERS (Oil.)

Anderson, The V. D., Co., Cleveland, O.

FIRE ALARM SYSTEMS.

Cory, Chas., & Sons, New York, N. Y.

FIRE DEPARTMENT SUPPLIES.

Williams, Wm. E., New York, N. Y.

FITTINGS (Pipe.)

Mark Mfg. Co., Chicago, Ill.

FIXTURES.

General Electric Co., Schenectady, N. Y.

FLANGES.

Crane Co., The, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

FLOOR PLATES (Wrought Steel Diamond and Ribbed Pattern.)

Scully Steel & Iron Co., Chicago, Ill.

FLUE CLEANERS (Soot and Scale.)

Scully Steel & Iron Co., Chicago, Ill.

FORGINGS (Iron and Steel.)

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Collingwood Ship Bldg. Co., Ltd.,
Collingwood, Ont., Can.
Hartman-Greiling Co., Green Bay, Wis.

FOUNDERS.

American Shipbuilding Co., Cleveland, O.
Scranton Fdy. & Engine Wks., New York City.
Seattle Const. & Dry Dock Co., Seattle, Wash.
Sun Shipbuilding Co., Philadelphia.
Wellman-Seaver-Morgan Co., Cleveland, O.

FOUNDRY EQUIPMENT.

Whiting Foundry Equipment Co., Harvey, Ill.

FRICTION BOARD.

Stratford, Geo., Oakum Co., Jersey City, N. J.

FUELING COMPANIES AND COAL DEALERS.

Hall, Geo., Coal & Transportation Co.,
Ogdensburg, N. Y.
Hanna, M. A., & Co., Cleveland, O.
Lorain Coal & Dock Co., Columbus, O.
Pickands, Mather & Co., Cleveland, O.

FURNACE FRONTS AND DOORS.

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FURNACES (Boiler.)

Continental Iron Works, Brooklyn, N. Y.

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Blackmer Rotary Pump Co., Petoskey, Mich.
McNab Co., The, Bridgeport, Conn.

GAGES (Steam and Water.)

Ashton Valve Co., The, Boston, Mass.
Penberthy Injector Co., Detroit, Mich.
Williams, Wm. E., New York City.

GAGES (Water.)

American Injector Co., Detroit, Mich.

GALVANIZED MATERIAL.

Larkin, J. K., & Co., New York, N. Y.

GASKETS.

Crane Co., The, Chicago, Ill.

GEARS (Marine Reduction.)

De Laval Steam Turbine Co., Trenton, N. J.
Hunt, Mirk & Co., San Francisco, Cal.
Hunt, Mirk & Co., Seattle, Wash.
Westinghouse Mch. Co., Pittsburgh, Pa.

GENERAL STEEL EQUIPMENT.

Bernstein Mfg. Co., Philadelphia, Pa.

GENERATORS.

General Electric Co., Schenectady, N. Y.

GRAPHITE (Boiler, Lubricating Greases.)

Dixon, Joseph, Crucible Co., Jersey City, N. J.

GRAPHITE PAINT.

Dixon, Joseph, Crucible Co., Jersey City, N. J.
Trout, H. G., Co., Buffalo, N. Y.
Williams, Wm. E., New York, N. Y.

GRATING (Boiler.)

Irving Iron Works Co., Long Island City, N. Y.

GREASE CUPS.

American Injector Co., Detroit, Mich.
Lunkenheimer Co., The, Cincinnati, O.

GREASES.

Dixon, Joseph, Crucible Co., Jersey City, N. J.

HAMMERS (Pneumatic.)

Dayton Pneumatic Tool Co., Dayton, O.
Independent Pneumatic Tool Co., Chicago, Ill.

HATCH FASTENERS.

Mulholland Hatch-Fastener Co., Cleveland, O.

HAWSERS (Manila.)

Whitlock Cordage Co., New York, N. Y.
Waterbury Co., New York, N. Y.

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All Naval Authorities Agree is Dangerous
Can Be Avoided by Using Only

IRVING-SUBWAY GRATING ^{INSTEAD} _{OF} PLATES

For FLOORS of FIREROOMS in OIL BURNERS

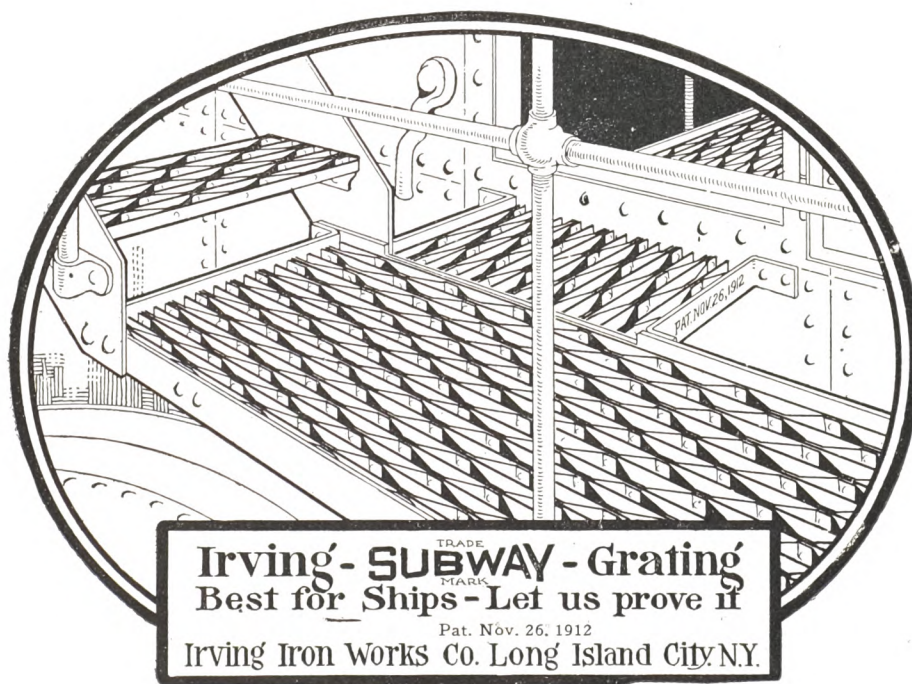
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IRVING-SUBWAY is Absolutely Non-Slipping
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Whitlock Cordage Co., New York, N. Y.

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American Engineering Co., Philadelphia, Pa.
American Ship Building Co., Cleveland, O.
Boston & Lockport Block Co., East Boston, Mass.

General Electric Co., Schenectady, N. Y.
Superior Iron Works, Superior, Wis.
Whiting Foundry Equipment Co., The, Harvey, Ill.

Williams, Wm. E., New York, N. Y.

HOISTS (Chain.)

Topping Brothers, New York City.

HOISTS (Electric, Pneumatic, Hand.)

American Engrg. Co., Philadelphia.
Superior Iron Works, Superior, Wis.

HOOKS.

Eckliff Circulator Co., Detroit, Mich.

HOSE.

Goodyear Tire & Rubber Co., Akron, O.
Mechanical Rubber Co., Cleveland, O.

HOSE (Pneumatic.)

Independent Pneumatic Tool Co., Chicago, Ill.
Mechanical Rubber Co., Cleveland, O.
Schrader's, A. Sons, Inc., Brooklyn, N. Y.
Williams, Wm. E., New York, N. Y.

HOSE COUPLINGS.

Independent Pneumatic Tool Co., Chicago, Ill.

ICE MACHINES.

Kroeschell Bros. Ice Machine Co., Chicago.
Roelker, H. B., New York City, N. Y.

IMPORT AND EXPORT AGENTS.

Grandfield, W. J., & Co., Philadelphia, Pa.

INDICATORS.

Cory, Chas., & Sons, New York, N. Y.
Electro-Dynamic Co., Bayonne, N. J.
McNab Co., The, Bridgeport, Conn.
Walker, Thos., & Son, Ltd., Birmingham, Eng.

INJECTORS.

American Injector Co., Detroit, Mich.
Penberthy Injector Co., Detroit, Mich.
Williams, Wm. E., New York, N. Y.

INSURANCE (Marine.)

Boland & Cornelius, Buffalo, N. Y.
Hutchinson & Co., Cleveland, O.
Osborn & Co., Chicago, Ill.
Richardson, W. C., & Co., Cleveland, O.
Vance & Joys, Milwaukee, Wis.

IRON (Bar.)

Hoffman, R. C., Co., Inc., Baltimore, Md.

IRON AND STEEL.

La Belle Iron Works, Steubenville, O.

IRON ORE.

Hanna, M. A., & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.

JIG MILL (Ship Yard.)

MacKinnon Boiler & Machine Co., Bay City, Mich.

LAMPS (Mazda and Arc.)

General Electric Co., Schenectady, N. Y.
Williams, Wm. E., New York, N. Y.

LANTERNS (Buoy.)

Safety Car Heating & Lighting Co., New York.

LAUNCHES.

Drein, Thomas, & Son, Wilmington, Del.

LAVATORIES.

Crane Co., The, Chicago, Ill.

LIFE BOATS, RAFTS, SUITS,**PRESERVERS AND LIFE SAVING EQUIPMENT.**

Brauer, Justus, & Son, Inc., Philadelphia, Pa.
Detroit Ship Bldg. Co., Detroit, Mich.
Drein, Thomas, & Son, Wilmington, Del.
Eckliff Circulator Co., Detroit, Mich.
Galbraith, C. C., & Son, New York, N. Y.
International Life Suit Co., The, New York.
Kahnweiler's, David, Sons, New York, N. Y.
Lane, C. M., Life Boat Co., Brooklyn, N. Y.
Welin Marine Equipment Co., Long Island City, N. Y.
Williams, Wm. E., New York, N. Y.

LIFE PRESERVERS.

Brauer, Justus, & Son, Inc., Philadelphia, Pa.
Kahnweiler's, David, Sons, New York City.
Lane, C. M., Life Boat Co., Brooklyn, N. Y.

LIGHTS (Gas.)

Safety Car Heating & Lighting Co., The, New York, N. Y.

LIGHTS (Electric.)

Cory, Chas., & Son, New York, N. Y.
General Electric Co., Schenectady, N. Y.

LIGHTS (Port.)

Hoffman, R. C., Co., Inc., Baltimore, Md.

LOCKERS.

Bernstein Mfg. Co., Philadelphia, Pa.

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Dixon, Joseph, Crucible Co., Jersey City, N. J.
Sun Co., Philadelphia.

LUBRICATORS.

Lunkenheimer Co., The, Cincinnati, O.
Penberthy Injector Co., Detroit, Mich.

LUMBER (Douglas Fir.)

Saari-Tully Lumber Co., Portland, Ore.
Douglas Fir Lumber Co., Portland, Ore.
Sullivan Lumber Co., Portland, Ore.

LUMBER (South Carolina Pine.)

Southern Pines Sales Corp., New York.

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American Ship Building Co., Cleveland, O.
Baltimore Dry Dock & Ship Building Co., Baltimore, Md.

Chicago Ship Building Co., So. Chicago, Ill.
Collingwood Ship Building Co., Ltd., Collingwood, Ont., Can

Fletcher, W. & A., Co., Hoboken, N. J.
Hartman-Greiling Co., Green Bay, Wis.
Johnston Bros., Ferrysburg, Mich.

Kingsford Fdy. & Machine Co., Oswego, N. Y.
Superior Ship Building Co., Superior, Wis.
Thomas Spacing Table Co., Pittsburgh, Pa.

Tietjen and Lang Dry Dock Co., Hoboken, N. J.

Toledo Ship Building Co., Toledo, O.
Winslow Marine Railway & Shipbuilding Co., Winslow, Wash.

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American Pipe Bending Machine Co., Boston.

MACHINERY (Second Hand.)

McCoy Brandt Machinery Co., Pittsburgh, Pa.

MACHINERY (Shipbuilders' Wood-working.)

Lane Mfg. Co., Montpelier, Vt.
Power, L., Co., Philadelphia, Pa.
Stetson Mach. Works, Seattle, Wash.

MACHINISTS.

Milwaukee Dry Dock Co., Milwaukee, Wis.
Rocky River Dry Dock Co., Rocky River, O.
Scranton Foundry & Engine Works, New York, N. Y.

Seattle Construction & Dry Dock Co., Seattle, Wash.

Sun Shipbuilding Co., Philadelphia, Pa.

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Camden Forge Co., Camden, N. J.

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Galbraith, C. C., & Son, New York, N. Y.

MARINE OIL.

Sun Co., Philadelphia.

MARINE RAILWAYS.

Rocky River Dry Dock Co., Rocky River, O.

MARINE SHAFT.

Camden Forge Co., Camden, N. J.

MARINE SPECIALTIES.

Thatcher, Geo. H., Co., Albany, N. Y.

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Hartman-Greiling Co., Green Bay, Wis.
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Mechanical Rubber Co., Cleveland, O.

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Robeson Preservo Products Co., Port Huron, Mich.

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Central Foundry Co., New York City.
Thatcher, Geo. H., Co., Albany, N. Y.

MOORING LINES.

Durable Wire Rope Co., Boston, Mass.

MOTORS (Electric.)

Electro-Dynamic Co., Bayonne, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Machine Co., E. Pittsburgh, Pa.

MOTORS (Winch.)

General Electric Co., Schenectady, N. Y.

NAILS

Larkin, J. K., & Co., New York, N. Y.

NAILS (Steel.)

La Belle Iron Works, Steubenville, O.

NAILS, WIRE (Coated.)

Larkin, J. K., & Co., New York, N. Y.

NAUTICAL INSTRUMENTS.

Ritchie, E. S., & Sons, Brookline, Mass.

NET ROPE.

Whitlock Cordage Co., New York, N. Y.

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Galbraith, C. C., & Son, New York, N. Y.
Stratford, Geo., Oakum Co., Jersey City, N. J.

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J. Fillmore Cox Engrg. & Tube Bending Machine Works, Bayonne, N. J.

OIL CUPS.

American Injector Co., Detroit, Mich.
Lunkenheimer Co., The, Cincinnati, O.

OIL (Marine.)

Sun Co., Philadelphia.

OXY-ACETYLENE WELDING AND CUTTING.

Linde Air Products Co., New York City.

OXYGEN.

Linde Air Products Co., New York City.

PACKING.

Crane Co., The, Chicago, Ill.
Goodyear Tire & Rubber Co., Akron, O.
Home Rubber Co., Trenton, N. J.
Mantell Packing Co., The, Elyria, O.
Mechanical Rubber Co., Cleveland, O.
U. S. Metallic Packing Co., The, Philadelphia.

PAINT (Canvas.)

Robeson Preservo Products Co., Port Huron, Mich.

PAINT (Graphite.)

Dixon, Joseph, Crucible Co., Jersey City, N. J.

PAINT (Marine.)

Murphy Varnish Co., Newark, N. J.

PAINT (Silica Graphite.)

Dixon, Joseph, Crucible Co., Jersey City, N. J.

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Siggers & Siggers, Washington, D. C.

PETROLEUM.

Sun Co., Philadelphia.

PIG IRON.

Hanna, M. A., & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.

PIPE.

La Belle Iron Works, Steubenville, O.

PIPE FITTINGS (Steel, Iron and Brass.)

Crane Co., The, Chicago, Ill.

PIPE (Iron and Steel.)

Larkin, J. K., & Co., New York, N. Y.

PIPE (Steel.)

Larkin, J. K., & Co., New York, N. Y.
Mark Mfg. Co., Chicago, Ill.

PIPE (Welded Steel.)

Continental Iron Works, Brooklyn, N. Y.

PIPE (Wrought Iron.)

Larkin, J. K., & Co., New York, N. Y.

PIPE BENDING MACHINERY.

American Pipe Bending Machine Co., Boston, Mass.

Cox, J. Fillmore, Engrg. & Tube Bending Machine Works, Bayonne, N. J.

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U. S. Injectors are automatic

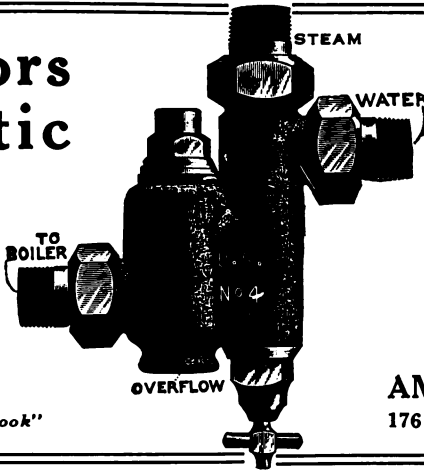
U. S. Injectors operate automatically with wide open suction at a lower steam than most injectors.

With throttled suction they are automatic at any pressure sufficient to enable injectors to get the water.

They work equally as well as a lifting injector or as a non-lifter.

Protect your boiler against feed-troubles by installing U. S. Injectors.

Write for Catalog D and "Engineers Red Book"



Superiority of U. S. Injectors

Easier to Operate—Turning on steam starts U. S. Injectors.

Wider Range—U. S. Injectors start at lower steam and work to higher steam than any other injector.

Hot Water—They handle hotter water and feed hotter water into boiler than any other injector.

AMERICAN INJECTOR CO.
176 Fourteenth Ave. Detroit, Mich.

LANE LIFE BOATS

C. M. LANE LIFE BOAT CO.



250 HURON ST. BROOKLYN, N. Y.

LAST LONGEST

ESTABLISHED 1844

A. SCHRADER'S SON, Inc.

783-803 ATLANTIC AVE.,

BROOKLYN, N. Y.

Manufacturer of

Diving



Apparatus



HIGHEST AWARDS

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Furnishers to U. S. Navy and U. S. Army Engineer Corps.
Outfits for Contractors, Waterworks, Sponge and Pearl Fishers, etc.

PINTSCH GAS LIGHTED BUOYS

Adopted by the English, German, French, Russian, Italian and United States Lighthouse Departments for Channel and Harbor Lighting. Over 2,200 Buoys and Gas Beacons in service.

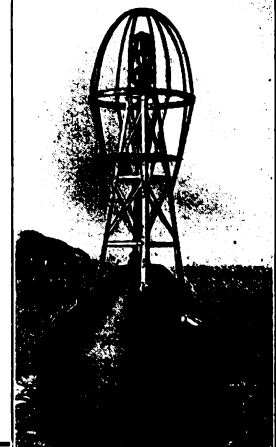
Burn Continuously from Eighty to Three Hundred and Sixty-five Days and Can be Seen a Distance of Six Miles

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SAFETY CAR HEATING & LIGHTING CO.

2 RECTOR STREET, NEW YORK

Chicago Philadelphia St. Louis San Francisco, Cal. Boston Montreal



Ashton Highest Grade POP SAFETY VALVES AND STEAM GAGES

Guaranteed to give Unequalled Efficiency, Durability and Perfect Satisfaction.

Special Features in Valves

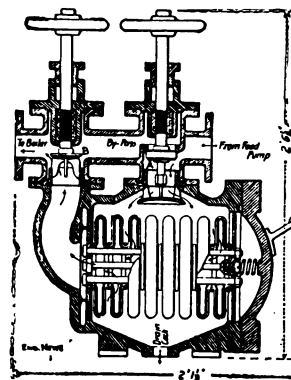
Outside Pop Regulation, Cam Lever Attachment, Jessop Steel Spring, Gages have Non-Corrosive Movements, Accurately Graduated Dials, Seamless Drawn Springs.

Specify the Ashton and Get the Best

THE ASHTON VALVE COMPANY

271 Franklin St. - BOSTON, MASS.

Branches: New York Chicago Philadelphia San Francisco



OUR Feed-Water Filters

will keep oil out of
your boiler

They Have No Equal

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Troy, N. Y.

PIPE UNIONS.

La Belle Iron Works, Steubenville, O.
Mark Mfg. Co., Chicago, Ill.

PIPE WELDING.

Goldschmidt Thermit Co., New York, N. Y.

**PLANING MILL MACHINERY
(Beveling and Edging.)**

Lane Mfg. Co., Montpelier, Vt.
Power, L., Co., Philadelphia, Pa.
Stetson Machine Works, Seattle, Wash.

PLATES AND SHAPES.

La Belle Iron Works, Steubenville, O.

PLUMBING (Marine).

Crane Co., The, Chicago, Ill.

PLUNGERS.

Camden Forge Co., Camden, N. J.

PNEUMATIC TOOLS.

Dayton Pneumatic Tool Co., Dayton, O.
Hartman-Greiling Co., Green Bay, Wis.
Independent Pneumatic Tool Co., Chicago, Ill.

PNEUMERCATORS.

Pneumercator Co., The, New York City.

PRESSURE REGULATORS.

Crane Co., The, Chicago, Ill.

PROJECTORS (Electric.)

General Electric Co., Schenectady, N. Y.

PROOFING (Canvas.)

Robeson Preservo Products Co.,
Port Huron, Mich.

PROPELLER BLADES.

Sheriffs Mfg. Co., Milwaukee, Wis.

PROPELLER WHEELS.

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Baltimore Dry Dock & Shipbuilding Co.,
Baltimore, Md.
Detroit Ship Building Co., Detroit, Mich.
MacKinnon Boiler & Machine Co.,
Bay City, Mich.

Milwaukee Dry Dock Co., Milwaukee, Wis.
Scranton Fdy. & Engine Works, New York.
Sheriffs Mfg. Co., Milwaukee, Wis.
Superior Ship Bldg. Co., Superior, Wis.
Toledo Ship Building Co., Toledo, O.
Trout, H. G., Co., Buffalo, N. Y.
Winslow Marine Railway & Shipbuilding
Co., Inc., Winslow, Wash.

PUBLIC ACCOUNTANTS.

Michigan Trust Co., Grand Rapids, Mich.

PUMPS.

Blackmer Rotary Pump Co., Petoskey, Mich.
Boston & Lockport Block Co., E. Boston, Mass.
DeLaval Steam Turbine Co., Trenton, N. J.
Gardner Governor Co., Quincy, Ill.
Kingsford Foundry & Machine Works,
Oswego, N. Y.

Roelker, H. B., New York, N. Y.

PUMP CONNECTING RODS.

Camden Forge Co., Camden, N. J.

PUMP CRANK SHAFTS.

Camden Forge Co., Camden, N. J.

PUMPS (Diaphragm.)

Boston & Lockport Block Co.,
East Boston, Mass.

PUMPS (Steam for Purification Apparatus.)

Gardner Governor Co., Quincy, Ill.

**PURIFICATION SYSTEMS
(Water.)**

Griscom-Russell Co., New York, N. Y.
Jewell Water Improvement Co., Chicago, Ill.
R. U. V. Company, New York, N. Y.
Schutte & Koerting, Philadelphia, Pa.

PYROMETERS.

Locomotive Superheater Co., New York, N. Y.

RAFTS.

Detroit Shipbuilding Co., Detroit, Mich.
Drein, Thomas, & Son, Wilmington, Del.
Lane, C. M., Life Boat Co., Brooklyn, N. Y.

REAL ESTATE (Shipyards Sites.)

Gretsch, Louis, Brooklyn, N. Y.

REFRIGERATING MACHINERY.

Kroeschell Bros. Ice Machine Co., Chicago.
Roelker, H. B., New York, N. Y.

**REGISTERING INSTRUMENTS.
(Draft.)**

Pneumercator Co., The, New York, N. Y.

RELEASING HOOKS.

Eckliff Circulator Co., Detroit, Mich.

**REPAIRS (Marine, Electric Arc
Welding.)**

Electric Welding Co., New York City.

REPAIRS (Marine.)

American Ship Building Co., Cleveland, O.
Baltimore Dry Dock & Ship Building Co.,
Baltimore, Md.

Bath Iron Works, Bath, Me.
Buffalo Dry Dock Co., Buffalo, N. Y.
Chicago Ship Building Co., So. Chicago, Ill.
Collingwood Ship Bldg. Co., Ltd.,
Collingwood, Ont., Can.

Commercial Boiler Works, The, Seattle, Wash.
Delaney, P., & Co., Newburgh, N. Y.
Detroit Ship Building Co., Detroit, Mich.
Fletcher, W. & A., Co., Hoboken, N. J.
Fore River Ship Bldg. Corp., Quincy, Mass.
Goldschmidt Thermit Co., New York, N. Y.
Johnston Bros., Ferrysburg, Mich.
Manitowoc Ship Bldg. Co., Manitowoc, Wis.
McLouth, Sydney C., Marine City, Mich.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Moore & Scott Iron Works, San Francisco.
Pennsylvania Shipbuilding Co., Philadelphia.
Pioneer Boiler Works, Port Huron, Mich.
St. Lawrence Marine Ry. Co.,
Ogdensburg, N. Y.

Seattle Const. & Dry Dock Co., Seattle, Wash.
Sun Shipbuilding Co., Philadelphia, Pa.
Superior Ship Bldg. Co., Superior, Wis.
Tietjen and Lang Dry Dock Co.,
Hoboken, N. J.

Toledo Ship Bldg. Co., Toledo, O.
Winslow Marine Railway & Shipbuilding
Co., Inc., Winslow, Wash.

RIGGING.

Baltimore Dry Dock & Shipbuilding Co.,
Baltimore, Md.

RIVER STEAMERS.

Ward, The Chas., Engrg. Works,
Charleston, W. Va.

RIVETS.

Carlin, Anthony, Cleveland, O.
Larkin, J. K., & Co., New York, N. Y.
Schaper Construction & Materials Co.,
New York City.
Stimpson, Edwin B., Brooklyn, N. Y.
Topping Brothers, New York City.

RIVET CUTTING MACHINERY.

Rivet Cutting Gun Co., The, Cincinnati, O.

RIVETING HAMMERS (Pneumatic.)

Dayton Pneumatic Tool Co., Dayton, O.
Independent Pneumatic Tool Co., Chicago, Ill.

RIVET SETS (Pneumatic.)

Dayton Pneumatic Tool Co., Dayton, O.
Independent Pneumatic Tool Co., Chicago, Ill.

RODS (Connecting.)

Camden Forge Co., Camden, N. J.

RODS (Upset.)

Larkin, J. K., & Co., New York, N. Y.

ROLLS (Bending and Straightening.)

Camden Forge Co., Camden, N. J.

ROPE (Manila Net.)

Whitlock Cordage Co., New York, N. Y.

**ROPE (Manila, Sisal and Other Hard
Fiber Cordage.)**

Waterbury Co., New York, N. Y.
Whitlock Cordage Co., New York, N. Y.
Williams, Wm. E., New York, N. Y.

ROPE (Transmission.)

Waterbury Co., New York, N. Y.
Whitlock Cordage Co., New York, N. Y.

ROPE (Wire.)

Durable Wire Rope Co., Boston, Mass.
Waterbury Co., New York, N. Y.
Williams, Wm. E., New York, N. Y.

ROPE DRIVES AND TRAMWAYS.

Waterbury Co., New York, N. Y.
Whitlock Cordage Co., New York, N. Y.

SAFETY SUITS (Life Preserving.)

International Life Suit Co., The, New York.

**SAW FILERS, STRETCHERS AND
GRINDERS (Circular and Band.)**

Wardwell Mfg. Co., Cleveland, O.

SECOND HAND MACHINERY.

McCoy Brandt Machinery Co., Pittsburgh, Pa.

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Baltimore Dry Docks & Ship Bldg. Co.,
Baltimore, Md.

Buffalo Dry Dock Co., Buffalo, N. Y.
Chicago Ship Building Co., So. Chicago, Ill.
Collingwood Ship Building Co., Ltd.,
Collingwood, Ont., Can.

Johnston Bros., Ferrysburg, Mich.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Seattle Const. & Dry Dock Co., Seattle, Wash.
Toledo Ship Building Co., Toledo, O.
Tietjen and Lang Dry Dock Co.,
Hoboken, N. J.

SCREWS.

Milton Mfg. Co., Milton, Pa.

SCREWS (Wood.)

Topping Brothers, New York City.

**SEARCHLIGHTS (Incandescent and
Arc.)**

General Electric Co., Schenectady, N. Y.

**SEPARATORS (Steam, Oil and
Water.)**

Anderson, The V. D., Co., Cleveland, O.
Crane Co., The, Chicago, Ill.
Griscom-Russell Co., New York, N. Y.

SHACKLES.

Topping Brothers, New York City.

SHAFTING.

Camden Forge Co., Camden, N. J.

SHEATHING FELT.

Stratford, Geo., Oakum Co., Jersey City, N. J.

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Commercial Boiler Works, The, Seattle, Wash.

SHEETS.

La Belle Iron Works, Steubenville, O.

SHIPBUILDERS.

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Detroit Ship Building Co., Detroit, Mich.
Fletcher, W. & A., Co., Hoboken, N. J.
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Great Lakes Boat Bldg. Co., Milwaukee, Wis.
Johnston Bros., Ferrysburg, Mich.
Manitowoc Ship Building Co., Manitowoc, Wis.
McLouth, Sydney C., Marine City, Mich.
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Pennsylvania Ship Building Co., Philadelphia.
Rocky River Dry Dock Co., Rocky River, O.
Seattle Const. & Dry Dock Co., Seattle, Wash.
Sun Shipbuilding Co., Philadelphia, Pa.
Superior Ship Building Co., Superior, Wis.
Tietjen and Lang Dry Dock Co.,
Hoboken, N. J.

Toledo Ship Building Co., Toledo, O.
Tusket Shipbuilding Co., Ltd., Tusket, N. S.
Winslow Marine Railway & Shipbuilding
Co., Winslow, Wash.

**SHIPBUILDERS WOODWORKING
MACHINERY.**

Lane Mfg. Co., Montpelier, Vt.
Power, L., Co., The, Philadelphia, Pa.
Stetson Machine Works, Seattle, Wash.

SHIPBUILDING SITES.

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TIMBERS.**

Douglas Fir Lumber Co., Portland, Ore.
Saari-Tully Lumber Co., Portland, Ore.
Southern Pine Sales Corp., New York.
Sullivan Lumber Co., Portland, Ore.

SHIPBUILDING SYSTEM.

Isherwood, J. W., London, E. C., England.

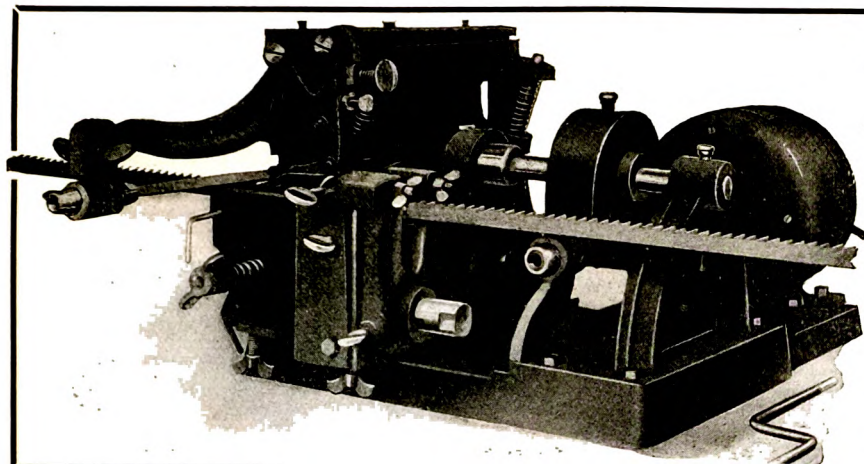
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Scranton Fdy. & Engine Works, New York.

SHIP FRAMING WORK.

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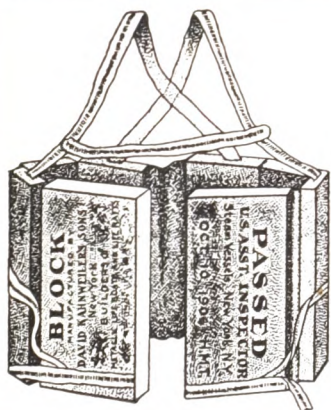
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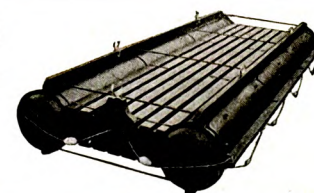
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SHIPYARD TOWER WHIRLER.

Dravo-Doyle Co., Pittsburgh.

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Central Foundry Co., New York City.
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Saari-Tully Lumber Co., Portland, Ore.
Southern Pine Sales Corp., New York.
Sullivan Lumber Co., Portland, Ore.

SPECIALTIES (Steam.)

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Crane Co., The, Chicago, Ill.
Lunkenheimer Co., The, Cincinnati, O.

SPIKES.

Larkin, J. K., & Co., New York, N. Y.

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Hoffman, R. C., Co., Inc., Baltimore, Md.
Schaper Construction & Materials Co.,
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Thatcher, Geo. H., Co., Albany, N. Y.

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Hollow or Solid.)**

Falls Hollow Staybolt Co., Cuyahoga Falls, O.
Scully Steel & Iron Co., Chicago, Ill.

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Long Island City, N. Y.

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Camden Forge Co., Camden, N. J.

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Ward, Chas., Engrg. Wks., Charleston, W. Va.

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Gardner Governor Co., Quincy, Ill.
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STEEL.

La Belle Iron Works, Steubenville, O.

STEEL EQUIPMENT (General.)

Bernstein Mfg. Co., Philadelphia, Pa.

STEERING GEARS.

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American Ship Building Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.

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(Water.)

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Jewell Water Improvement Co., Chicago, Ill.
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Schutte & Koerting Co., Philadelphia, Pa.

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Locomotive Superheater Co., New York, N. Y.

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Kidd, Joseph, & Son, Duluth, Minn.

SURVEYORS (Ship.)

American Bureau of Shipping, New York City.

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General Electric Co., Schenectady, N. Y.

TANKS (Acetylene.)

Linde Air Products Co., New York City.

TANKS (Riveted.)

Bath Iron Works, Bath, Me.
Lake Erie Boiler Works, Buffalo, N. Y.

TANKS (Welded Steel.)

Continental Iron Works, The, Brooklyn, N. Y.

**TELEGRAPH (Mechanical and Elec-
trical.)**

Cory, Chas., & Son, New York, N. Y.

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Superior Iron Works, Superior, Wis.

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GRAPHS (Ship.)

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Topping Brothers, New York City.

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Saari-Tully Lumber Co., Portland, Ore.
Southern Pine Sales Corp., New York.
Sullivan Lumber Co., Portland, Ore.

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Waterbury Co., New York, N. Y.
Whitlock Cordage Co., New York, N. Y.

TOWING LINES (Wire.)

Waterbury Co., New York, N. Y.

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TRANSMISSION (Rope.)

Waterbury Co., New York, N. Y.

TRAPS (Steam, Air and Vacuum.)

Anderson, The V. D., Co., Cleveland, O.
Crane Co., The, Chicago, Ill.

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Galbraith, C. C., & Son, New York, N. Y.

TROLLEYS.

Whiting Foundry Equipment Co., Harvey, Ill.

TURBINE SHAFTS.

Camden Forge Co., Camden, N. J.

TURBINES (Steam.)

DeLaval Steam Turbine Co., Trenton, N. J.

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Topping Brothers, New York City.

UNIONS.

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Auld Co., The, Philadelphia, Pa.
Crane Co., The, Chicago, Ill.
Lunkenheimer Co., The, Cincinnati, O.
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Scully Steel & Iron Co., Chicago, Ill.
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Page & Jones, Mobile, Ala.
Richardson, W. C., & Co., Cleveland, O.
Vance & Joys Co., Milwaukee, Wis.

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Chicago Steamboat Exchange, Chicago, Ill.
Farley, Edward F., Co., Chicago, Ill.
Richardson, W. C., & Co., Cleveland, O.

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Topping Brothers, New York City.

WASHERS (Cast.)

Larkin, J. K., & Co., New York, N. Y.

WASHERS (Iron and Steel)

Larkin, J. K., & Co., New York, N. Y.
Milton Mfg. Co., Milton, Pa.

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Camden Forge Co., Camden, N. J.

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Galbraith, C. C., & Son, New York, N. Y.

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Port Huron, Mich.

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TEMS.**

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Jewell Water Improvement Co., Chicago, Ill.
R. U. V. Company, New York, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

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Portable Electric Welding Co., Sandusky, O.
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Lunkenheimer Co., The, Cincinnati, O.

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Chase Machine Co., Cleveland, O.
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WINDLASSES.

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American Ship Building Co., Cleveland, O.
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Eckliff Circulator Co., Detroit, Mich.

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(Shipbuilding.)

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Power, L., Co., Philadelphia, Pa.
Stetson Machine Works, Seattle, Wash.

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Lake Erie Dry Dock & Mill Co., Sandusky, O.
Rocky River Dry Dock Co., Rocky River, O.

YACHT ROPE.

Whitlock Cordage Co., New York, N. Y.

YARN (Lath, Fodder.)

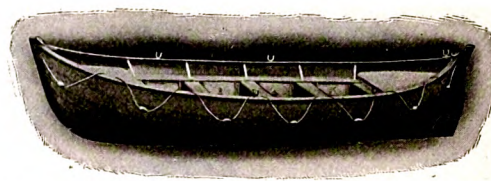
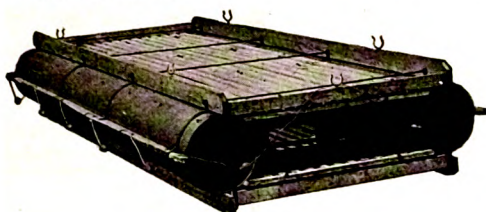
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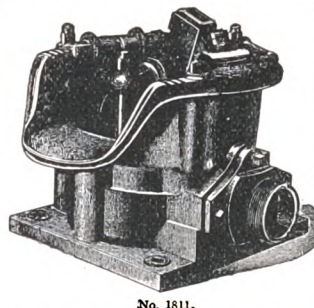


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These boilers have been used only one month and are in excellent condition.
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FOR SALE: — COMPLETE MARINE plant with fittings. Boiler, upright-cone top submerged flues. Allowed 115 lbs. Engine—double 8 x 8-in. simple high pressure with fitting—driving bearing — shaft wheel, etc. Westinghouse turbine generating set complete, switchboard, etc.; double acting Fairbanks pump-injectors—gages, etc. A complete rig for small boat. Drives hull 72 ft. x 18 ft. 8½ miles per hour. Being taken out to install higher power. Address Box 189, THE MARINE REVIEW, Cleveland, O.

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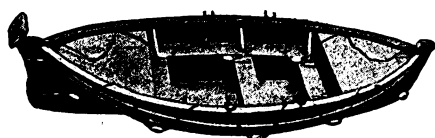
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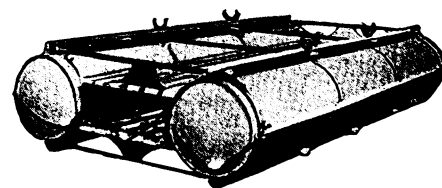
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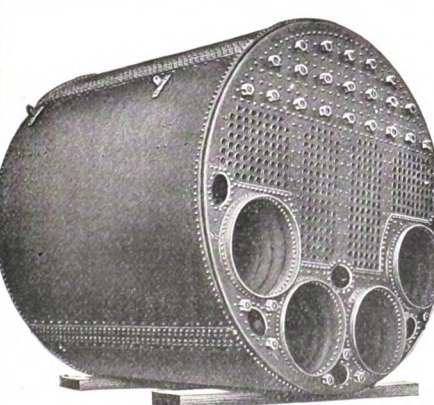
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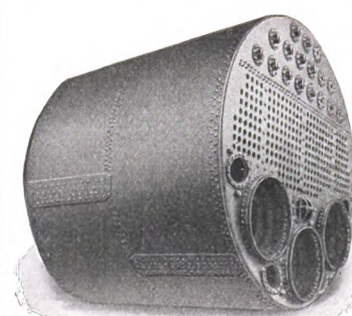
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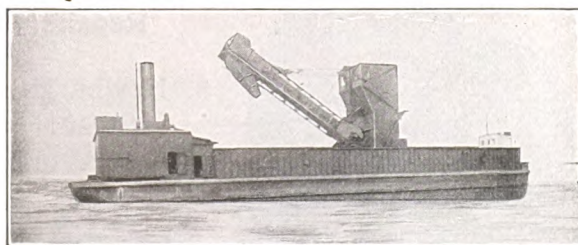
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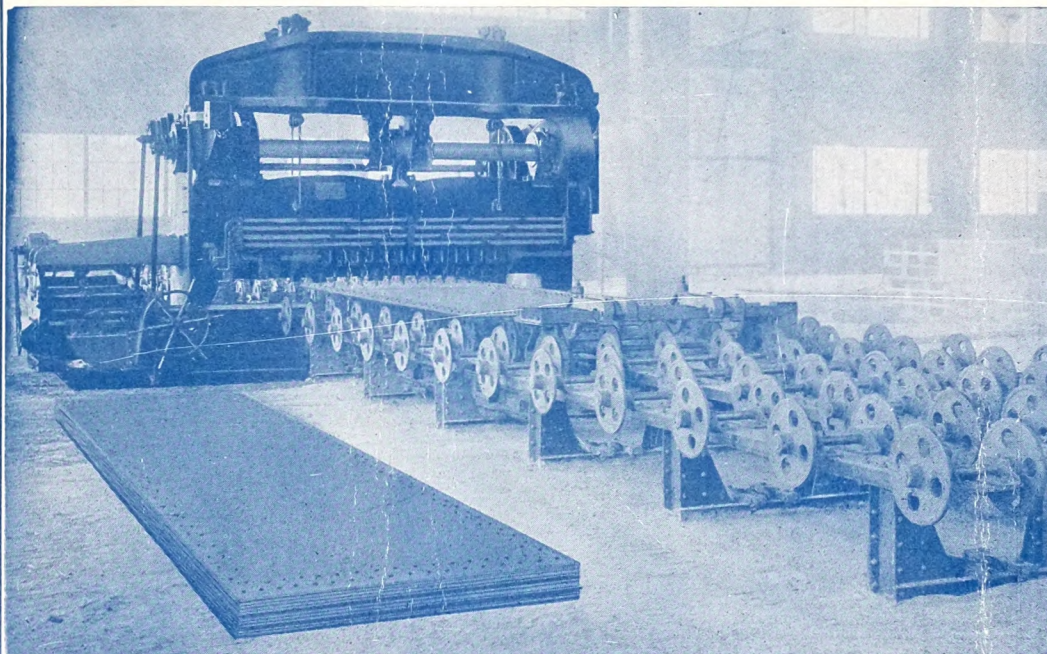
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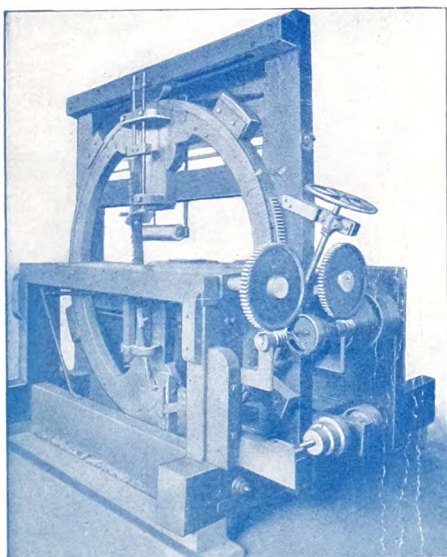
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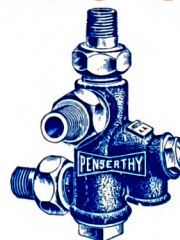
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